THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIV. No. 1902.] LONDON, OCTOBER 24, 1899. [51ST YEAR. PRICE 6d.

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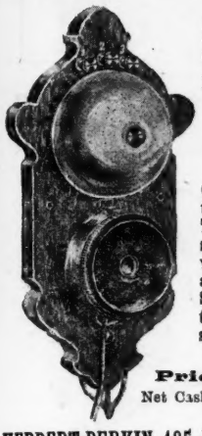

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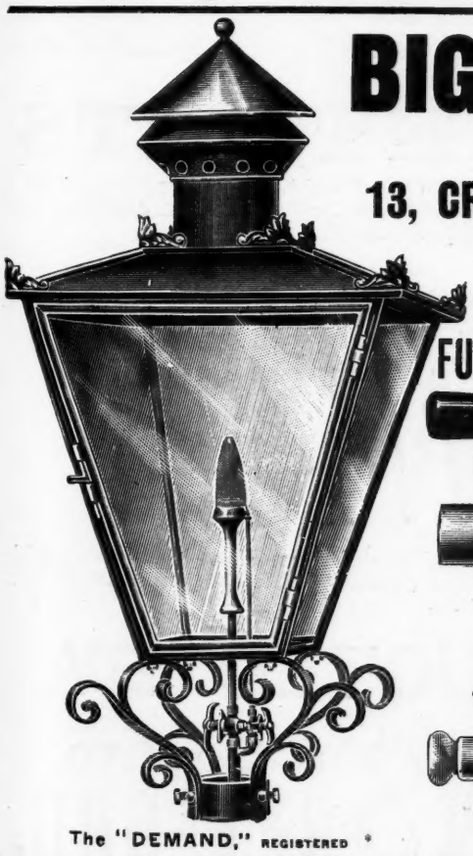

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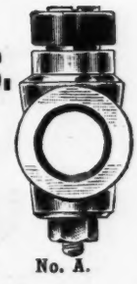

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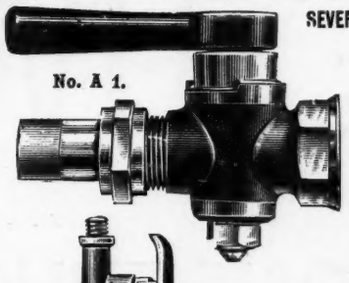

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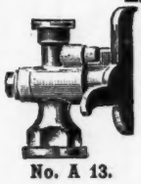

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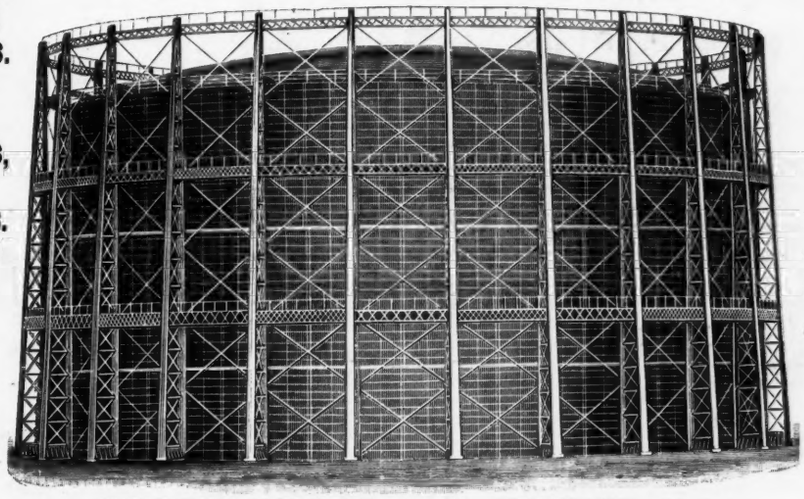

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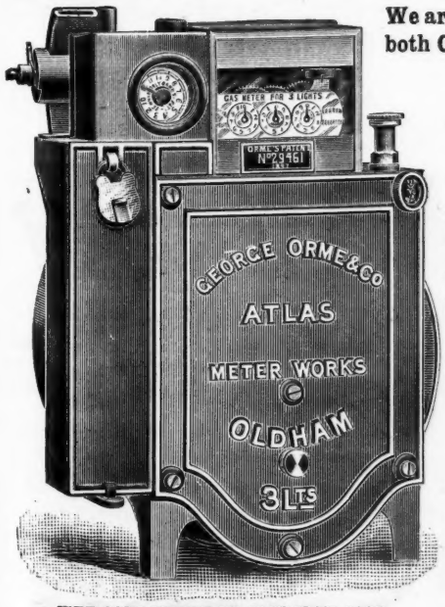

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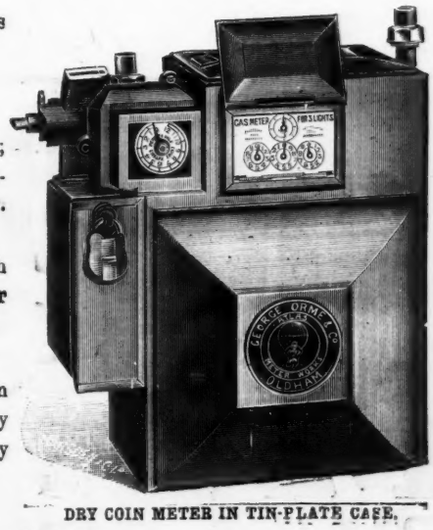

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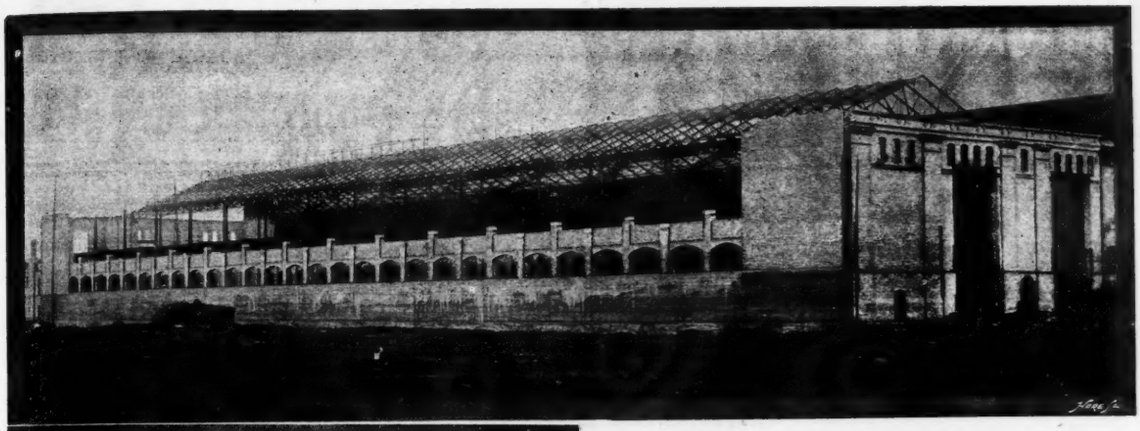

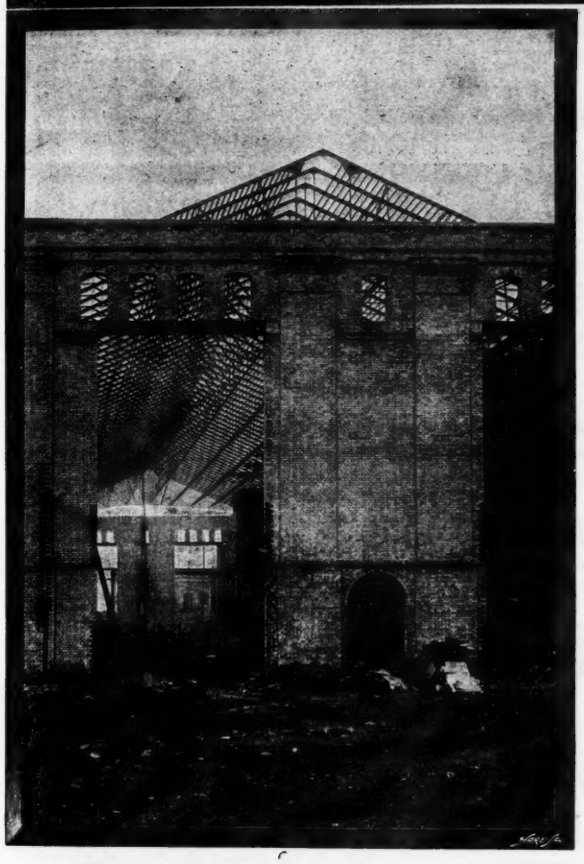

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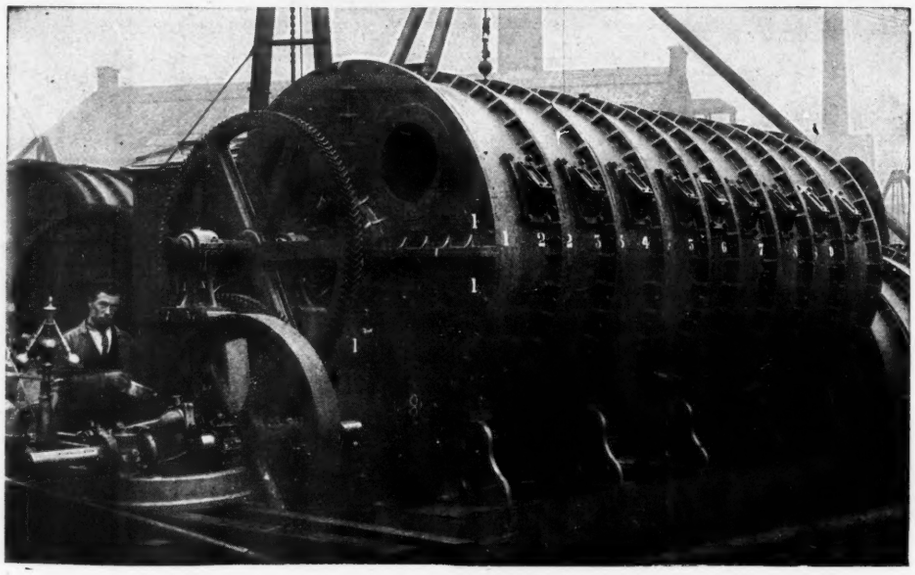

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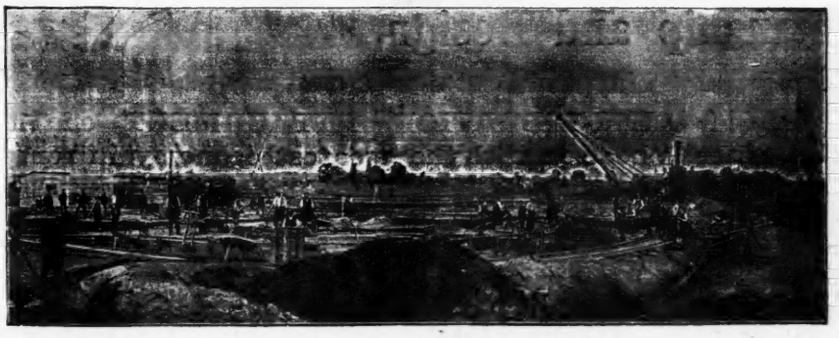

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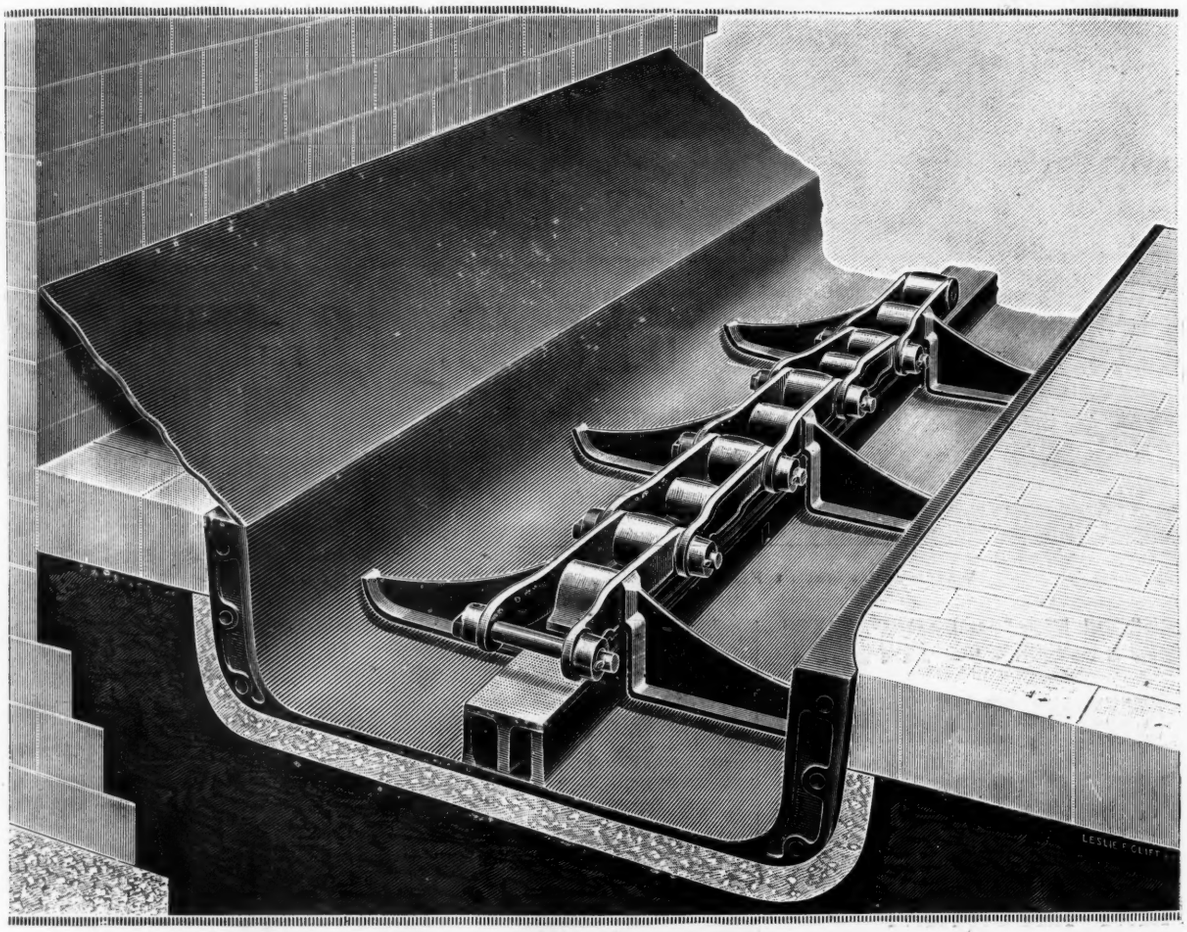

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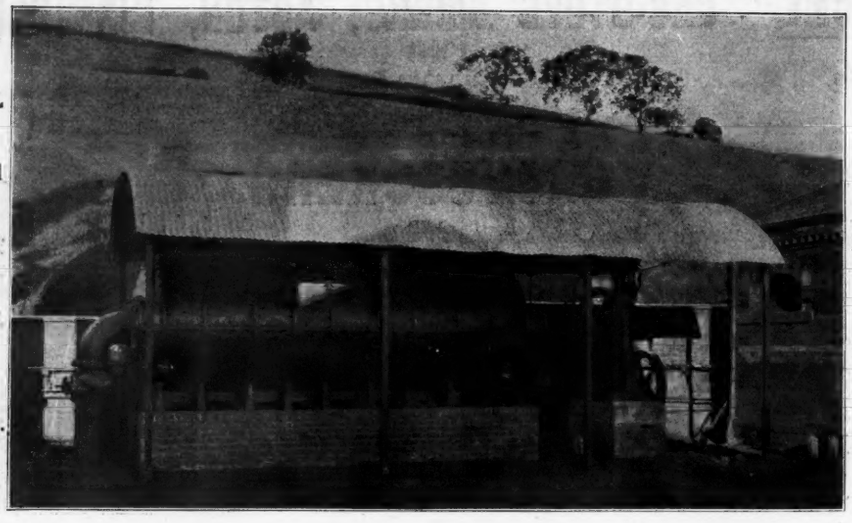

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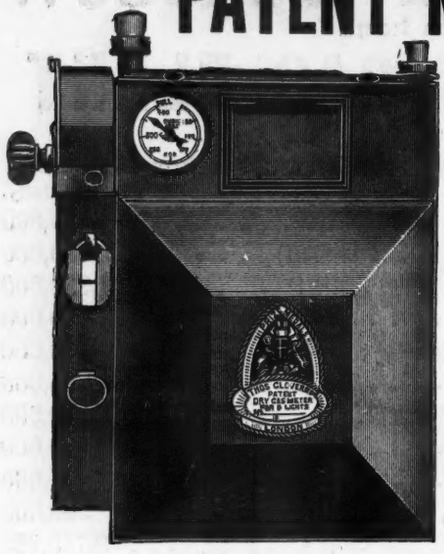

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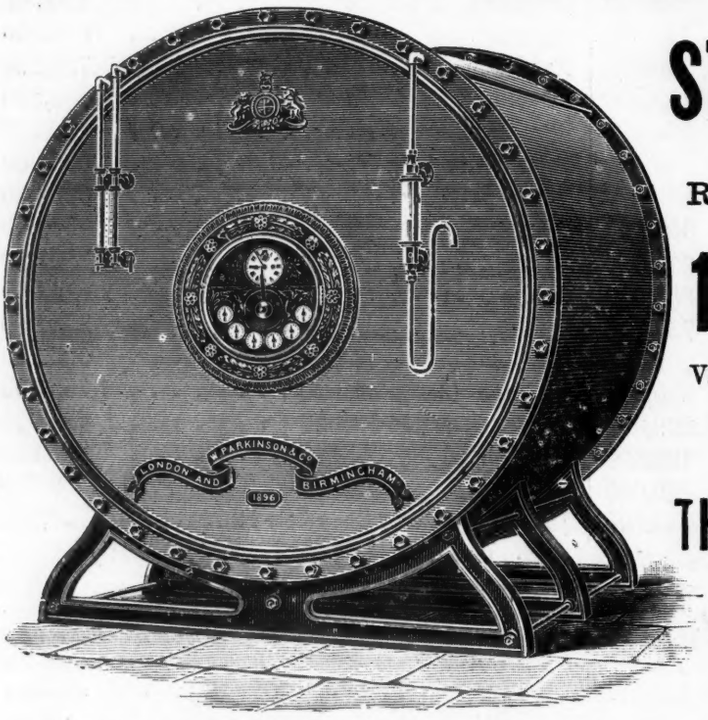

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EDITORIAL NOTES.

The Workmen's Compensation Act—The Case of Main-Layers.

ONE of the most important questions of construction arising out of the terms of the Workmen's Compensation Act is as to the extent of the protected area, so to speak, within which a workman engaged in the ordinary course of his occupation can claim under the Act. The words of the Act (section 7) are that the employment must be "on, or in, or about" a factory, &c., within the scope of the Act. The greatest uncertainty prevails as to the application of the word "about," in this connection. Judgments already given, and the opinions of legal writers on the point, all agree in holding that, though the word has a wide meaning, and as such is an enlargement of the condition of liability expressed by the preceding words "on, or in," it also has a limiting sense. This interpretation is obviously the natural one. There is no real difficulty in understanding when a man is working "about" a place, yet cannot strictly be said to be either on or in it. The trouble of construction arises in regard to the man who is sent away from a factory in order to do outside work. Assuming that the man goes off altogether, and has no physical link of any kind with the factory, there is no doubt that as soon as he is clear of the building he is also beyond its statutory protection. A man loading a cart from a factory, in the public street just outside the walls, comes within the including operation of the word "about," because he is in close propinquity to the establishment. A man erecting machinery, sent from the factory, on a customer's premises 1½ miles away, is not working "about" the factory, and accordingly cannot take advantage of the Act. This latter decision appears, at the first glance, to cover the case of workmen sent out from a gas factory to fix stoves and other fittings in the district.

Additional support to this view of the law is apparently given by the decision of Judge Stonor, at the Marylebone County Court, in the case of *Bennett v. Aird and Sons*, reported in our last week's "Legal Intelligence." Here a man employed in breaking open a road, for the purpose of laying a water-main, missed his blow and dislocated his shoulder. It was objected by the employer that the accident did not come within the scope of the Act. According to the report, the judgment turned upon the application of the words "mechanical power" in section 7 of the Act. For the plaintiff, it seems to have been submitted that, inasmuch as the "wedge and beetle" is a well-known "mechanical power," a man who used it came thereby within the scope of the clause. That is to say, the case apparently turned upon the question whether a workman who is required to make use of the wedge, or the lever, or the inclined plane, or the wheel-and-axle, or pulley-blocks, *ipso facto* becomes a "factory," or makes the ground upon which he stands an "engineering work" within the meaning of the Act. Our report is much condensed; and we offer this suggestion of the nature of the point at issue with all reserve. As, however, Judge Stonor talked of nothing else besides "the significance of the words 'mechanical "power,'" and never mentioned the fateful preposition "about," we are probably not wrong in our apprehension of the truth of the matter. Then, of course, it must be agreed that the learned Judge acted rightly in disallowing this sophistical attempt to attach to the clause a meaning which it could not have if the words considered are given their ordinary sense.

This elucidation of the point in the case leaves out of question the more important issue, which our esteemed correspondent writing on the subject thought to settle off-hand by declaring that the decision "excludes from the "operation of the Act all men engaged in laying or repair-"ing mains or services." It does nothing of the kind, as a little more consideration will show. We should be sorry for it to go forth as an editorial opinion that gas companies incur no liabilities under the Act in respect of the men employed in the distribution department, either with or without reference to this particular judgment. This is far too sweeping a statement. Who can say what extension the Courts might give to the word "about," in the case of an accident caused by gas transmitted through mains directly connected with the works, being a factory within the meaning of the Act? The point has not yet been argued; and therefore one may have his own opinion as to the limit of liability. We do not say that there is liability

co-extensive with the distributing network; but remembering the subtleties of the legal mind, he would be a bold man who should say there is not. The plaintiff Bennett sued his immediate employers, a firm of main-laying contractors, and pleaded that he was a "mechanical power" because he could not otherwise show any connection with a factory. Probably the water-main in this instance started from a storage reservoir, which is certainly no factory. But if the main had been a pumping-main, directly connected with power machinery, and the accident had had the remotest connection with what was going on in the pipe itself, the case would have borne a very different complexion. It is, however, impossible to follow up the hypothetical instances in which men employed in the work of gas distribution might claim the protection of the Act. Our advice to gas-works administrations is not to raise the point, but if the accident occurs in the ordinary way of the work to pay up without further question.

Proposed Municipalization of the Leamington Priors and Cardiff Gas Undertakings.

It is reported that the Leamington Town Council have thought better of their decision of September, 1897, against the purchase of the undertaking of the Leamington Priors Gas Company. At a special meeting of the Council held on Monday last week, the whole question was reconsidered, with the result that, by an overwhelming majority, it was resolved to put in force the power of purchase conferred upon the Corporation by their Act of 1896. The decision is a triumph for Mr. Thomas Newbigging, who advised the Corporation to buy the property two years ago; but this sage counsel was rejected. Mr. Newbigging told the Corporation then that the property would improve; and the fact of his forecast having been justified by experience has gone far to convert the members of the Town Council to his judgment. It is only just in time. The statutory circumstances are somewhat singular. There are not many Corporation Acts that contain permissive provisions for the acquisition of a gas undertaking. More usually the permission is put into a Company's Act, and is reminiscent of a tough parliamentary fight. In the case of Leamington, however, the Company are on the best of terms with the Corporation; and no objection seems to have been raised to the acquisition of conditional purchasing powers by the Corporation in 1896. These powers had to be exercised within three years; and therefore the present is the last opportunity the Corporation would have of taking advantage of their statutory position in this regard. It is a pity that several of the supporters of the purchase in the Town Council meeting relied upon the expectation of making handsome profits to be applied in relieving the rates. There will not be much surplus to begin with, by the time the property is paid for. Alderman Wackrill, the mover of the resolution, was on safer ground in arguing that the transfer would be made without cost to the town, and that the first thing to be done afterwards would be to popularize gas among the town population. If, as was stated, at present only about one-half of the people burn gas, it cannot be pleaded as an excuse for over-taxing the consumers that they are practically identical with the ratepayers. Naturally, with the immediate prospect of purchase hanging over their heads, the Directors of the Company have not launched out into coin-meter supplies and other luxuries not instantly remunerative. When the Corporation take charge, they will be able to attend to this and numerous other improvements calculated to benefit the town, provided the hands of the Gas Committee are not tied to a rate-relieving policy.

Cardiff is another place where the dropped thread of negotiations for gas-works purchase is to be taken up again. It was in 1890 that a Committee of the Cardiff Town Council came to terms, provisionally, with the Directors of the Gas Company, upon a basis of valuation which, in the light of experience, appears very reasonable and favourable to the town. The Directors were willing to accept 27 years' purchase of the maintainable profit, to which was to be added the amount of temporary loans, £56,000. This meant that the undertaking could have been had for about £500,000. The proposal of the Committee was not adopted by the Corporation—chiefly owing to the opposition of the present Deputy-Mayor. There was some "feeling" in regard to the matter at the time; and, in addition, it was largely thought in the town that the electric light was going to supersede gas. The leading men of the Corporation are believed to have recognized their mistake; and the Mayor called a special meeting for yesterday to reconsider the whole question. Local opinion seems to have veered round to the idea that the gas-works should be purchased now, though it is recognized that the price will be a good deal higher than that which would have been taken ten years ago. A Cardiff newspaper republishes the terms of the fatal resolution of June, 1890, against the purchase scheme. It runs: "That, having regard to the improve-"ment and great changes which are being effected in the "public and private lighting of large towns and centres "of industry, the Corporation does not consider this "an opportune occasion for purchasing the Cardiff Gas-"Works." The premiss was quite just; but a lamentable omission was made of the name of the kind of public and private lighting in which the great improvements and changes were in progress. This happened to be gas. If the word had been put in, the resolution would have shown good cause why the undertaking of the Cardiff Gas Company should have been acquired by the town, in its own interest. Another sad example of the lack of "lucidity," which an almost forgotten critic of the national character once distinguished as a defect. If the Cardiff Corporation do approach the Gas Company again, they must be prepared for a surprise. The Directors are the custodians of the property of the shareholders; and they will be less wise than we take them for if they do not require a full and fair price for it. Investments of this character do not grow on every hedge.

The Church and Labour Problems.

The proceedings at the recent Church Congress would not call for notice again this week were it not that—as if to direct attention to the unpractical and unenlightening character of the internecine wranglings of Ritualists and Evangelists—an afternoon was at the fag end devoted to the consideration of "The Church and Social Problems." The short space of a couple of hours was about all that the Church could spare out of a week's session to discuss the questions of Poor Law Relief, Conciliation in Labour Disputes, Old Age Pensions, and the Housing of the Poor. Well might Mr. George Harwood, M.P., speaking on the second of these subjects, declare that the real explanation of the indifference of the working-classes to the Church lay in the fact that its answer to the call to grapple with the great social problems of the age was "to threaten "to shatter itself to atoms about incense." Canon Scott Holland protested that this is an antithesis, because the "sacerdotal" clergy are the hardest workers, and the most popular of men, amongst the poorest of the working classes. But he misses the point. The popularity and influence of these men with the poor are due to their hard work and personal goodness, not to the incense in their churches; and, whilst the influence of the former is practically confined to the parishes where they labour, the wranglings of the Church over the latter—the subordination of fundamentals of Christianity to "comparative "trifles" in their public conferences—is of far-reaching effect, and tends more and more to alienate the working-classes from the Church in general.

As was only to be expected—in view of the ridiculously limited time devoted to the vast field of topics that we have enumerated, the discussion thereon was devoid of all practical suggestion for their solution. But if the clergy who were absent as well as, or even more than, those who were present, will ponder some of the home-truths to which Mr. Harwood drew attention in regard to the failing influence of the Church among practical men, and over practical affairs, some good may result. Mr. Harwood, in discussing the attitude of the Church towards conciliation in labour disputes, put forward, as one reason why the working-classes did not turn to the Church for arbitrators in the conciliation of their labour disputes, the suggestion that it was because "the men had not faith in their "friendship. They recognized that they [the clergy] "meant well to them, though often in a feeble sort of way; "but they did not believe that they would, at the risk of "offending the landed gentry or the employers of labour, "stand by them in their struggles to permanently elevate "their condition." If by this Mr. Harwood means to suggest that the clergy should enter upon the duties of "arbitrators" with a determination to always "stand by" the men, and find in their favour, we can only say that such "arbitration" is little likely to lead to "conciliation" in

labour disputes, and need only quote Mr. Harwood's own declaration "that most of the mischief in the world is not "done by wicked people, but by earnest people who "happen to be wrong-headed." It is not so much by intervention in labour disputes that the clergy (most of them woefully ignorant of the facts and conditions of industrial life) can do useful service, as by the prevention of unjustified and mischievous strikes, through the preaching of moderation and sense, and the counteraction of misleading and ruinous flattery by the advice of an informed and candid friend. But they have first to acquire the requisite information, and secondly to gain the friendship of the working classes.

Mr. Harwood's is the only paper on "Social Problems" calling for any remark. From amongst those read during the other sessions of the Congress, Archdeacon Diggle's paper on "Speculation and Gambling" deserves mention; while the thoughtful address delivered by Mr. George Livesey, on "Certain Needful and Needless Sunday Em-"ployments" (and discussed in this column last week), stands out as the contribution of an earnest and withal practical man.

The State of the Labour Market.

Our Edinburgh Correspondent last week referred to, but ventured upon no explanation of, the present "extraordi-"nary scarcity of workpeople, both skilled and unskilled." As he remarks, the scarcity is a matter of serious importance to gas managers looking round for their winter hands, and is, moreover, likely to stimulate the demand for higher wages. The explanation of the dearth of hands is, however, we think not far to seek. It lies in the fact that trade throughout the country is, as we have recently pointed out, enjoying a season of almost unprecedented activity. Mines are working more days per week than for many years past; pits thrown idle when prices were too low for profitable working are once more open to the miner; imports and exports are increasing in quantity as well as in money value; and, in fact, evidence is to be found on every hand that trade is "booming." The Board of Trade statistics as to the state of employment during the month of September only confirm all previous indications. We select a few facts therefrom to make this clear. The percentage of unemployed members returned by Trade Unions was lower than at any similar period since 1889; and, whereas the percentage ranged from 2·2 to 5·3 per cent. (and averaged 3 per cent.) during 1898, it has not risen above 3 per cent., and has averaged about 2·5 per cent. during the first nine months of this year. In the pig-iron industry, 380 furnaces—employing 25,384 hands—were in blast at the end of September in the districts of the United Kingdom reported upon, as against 356 furnaces—employing 23,620 workpeople—in September last year; while 83 tin-plate works, giving employment to 20,813 hands, were at work last month, as compared with 63 works and 15,585 hands a year ago. The same tokens of activity are found in practically all other industries; and difficulty in getting sufficient men is reported from some agricultural districts. When commenting upon the report as to the changes in rates of wages in 1898, we noticed, from the preliminary figures given for the first half of 1899, that the increase this year bade fair to considerably exceed the record of last—nearly a million persons in the industries which report to the Board of Trade having received a rise in wages up to the 30th of June. Since that date nearly 540,000 of these have had their wages increased; the number in September being 189,000, of whom 130,000 were coal miners. There were no decreases reported. These higher wages are almost entirely due to the great demand for hands; and with some thousands of men withdrawn from their employment to join the colours, the scarcity of workpeople is, for the present at any rate, likely to become more, not less, marked. The question may prove a serious one for some companies; and the manager with the largest proportion of machinery in his retort-houses will view the prospect with the easiest mind.

A Good and Bad Outlook for Gas.

The most ardent of followers of the fortunes of the gas industry must sometimes feel a little weary of the endless controversy over the relative cheapness, efficiency, and other points of gas and electric lighting. These arguments have been going on for many years, without bringing the conclusion any nearer. The introduction and successful establishment in popular favour of the Welsbach gas-light has proved a powerful reinforcement of the case for gas, and has given the electricians a sharp check; but it has not stopped the arguments, which are constantly, indeed, breaking out in fresh places. It is not very often that this familiar polemic figures in the correspondence columns of the leading London newspapers; and it is therefore worthy of passing remark that an animated exchange of opinions respecting the comparative merits of gas and incandescent electric lighting for interiors has been going on of late in the "Pall Mall Gazette." We should not, perhaps, have noticed the letters, but for the interesting circumstance that they testify to the way in which improved gas lighting is recovering its ground, after having been temporarily ousted by electricity. It is not only that the gas is so much cheaper than the electric light, although this is, of course, a serious consideration with most people. Factory owners, shopkeepers, and others say they are relinquishing the electric light and—not exactly going back to gas, but rather going forward with it, because it is so superior a light. The large firms and establishments cannot find anything in electricity to equal the new intensified patterns of incandescent gas-lights; and professional men and others having delicate work to do are losing patience with the incandescent electric lamp as usually worked by the supply companies. One writer asks if an electrical partisan has "ever tried to make a drawing, or do any kind of delicate "handiwork, by a couple of so-called 16-candle electric "lights;" and he opines not, or he would surely understand "the longing of all our office staff to return to the incandes-"cent gas-light which we had in our former offices."

But then follows a peculiar complaint: "Unfortunately, "my lease prohibits the use of gas on these premises." This last is a serious matter. One would like to know if it is at all a general restriction in the case of new office buildings. If so, the question naturally arises: What had better be done to procure its removal? No artificial support of electric lighting of this kind will long avail to maintain it, in face of the new discovery of consumers that the light they "obtain from the gas is sufficiently superior to "the electric light to warrant double the annual expendi-"ture." If our leading gas undertakings properly looked after the new buildings in their districts, and kept in touch with the architects—as the electricians are careful to do—the tendency of fashion in artificial lighting might be kept along common-sense lines. As it is, the architect goes on his æsthetic way regardless of these mundane considerations. People condemned by the nature of their avocations to inhabit or use some of the showiest modern buildings, are often driven to ask despairingly where architects themselves live. Speaking at the opening meeting for the session of the Architectural Association, the President (Mr. G. H. Fellowes-Prynne) said that he often wished artists, engineers, and architects could be brought into closer union and sympathy with one another. This is a worthy aspiration; but it does not quite cover the ground. The architect may love his elevations, his sky-line, and his mouldings, and welcome; but he ought to pay a little more heed than he usually does to the common needs of the people who have to live in the buildings which display his taste in these matters. There is no quick and easy way to making interiors light and healthy by arbitrarily banishing the gas, whether for lighting or heating, which as a rule architects have never known how to employ aright. It will seriously handicap gas in the future if architects get into the way of not specifying for the gas-piping while the building is in course of erection.

Laying of the Foundation Stone of the Granton Gas-Works.

In another column will be found a special account of the interesting beginning of the new Granton station of the Edinburgh and Leith Gas Commissioners. The foundation-stone laying was a very worthy municipal function. This happy commencement of the important work which Mr. W. R. Herring, the Engineer to the Commission, is doing for the people of Edinburgh, deserves to be commemorated in civic history; and we can only hope that all the notable and influential personages present on the occasion may be preserved in health and strength to assist at the ceremony next in order—of turning on to the town mains the gas manufactured on the new site. The history of the gas supply of Edinburgh is a chequered one; but it is to be hoped and believed that the long lane

—and a narrow and uphill one it was—has come to its turning at last. An extremely good narrative of the chief episodes in the Edinburgh and Leith gas supply was given by the Lord Provost, from which it is to be learnt that so late as 1866 there was active competition between the two Gas Companies. Those amateurs of cheap gas who think that this may be a good way of procuring it, should read the Lord Provost's remarks on the subject. We have never lost an opportunity for expressing admiration of the Scottish rule of municipalized gas supply; and the wonderful success that has rewarded the enterprise of the Edinburgh and Leith Corporations in acquiring the property of the local undertakings at an appropriate time will, we hope, commend this principle still more to the appreciation of English gas-supplying municipalities. If it is urged that the best of systems is useless unless properly administered, it might be asked when Scotland lacked good men to do her public work.

The Doleful Cry of the Chimney Sweep.

NEARLY four years ago, the voice of the chimney sweep began to be raised in complaint of the interference with his business by the coin gas-meter. During the period that has passed since then, matters have gone from bad to worse with the fraternity of the brush and soot-bag. The other day a practitioner in this line, named Nye, came before Judge Bacon at the Bloomsbury County Court on a judgment summons. The business at this particular Court is such a moving picture of London life, from a certain point of view, that the newspapers have come to watch it assiduously day after day for "types." This time they had a splendid subject, as the following brief but pointed colloquy indicates. "Judge Bacon: Why don't you pay? "Defendant: I ain't got it. Business is blooming awful. "Judge Bacon: I suppose people want their chimneys "swept? Defendant: Not as they used; I'm nearly ruined, "all through automatics. They has the penny-in-the-slot "gas-stoves, and all the blessed summer they never lights "a fire. What is a poor sweep to do?" This man was a bit of a philosopher in his degree. He was being sued for the value of a "copper" had upon the "hire system," which probably in this case meant the application of the familiar legend of cheap emporiums, "Weekly payments taken." He remarked that the article in question was worthless, and had fallen in two: "When you buy things on the hire "system," he observed, "they generally last as long as you "keep on paying; but this copper didn't do that." What a lurid light is here thrown upon the working of the system of "deferred purchase!" Let us hope that the condemnation does not extend to the goods and fittings attached to the coin meters which were the primary cause of this poor sweep's falling into adversity. Sympathetic comment upon the case was made in the "Daily "News," which remarked very justly: "No doubt some "petty industry perishes every day from causes of a like "sort. Every change, however slight, in the old order "of life, makes somebody's services superfluous, and, bit "by bit, the minor crafts die out." It is the old story, in a modern setting, of King George the Third's left-off shoe-buckles. The amazing popularity of coin gas-meters might have been expected to tell in other ways besides increased gas consumption; but this acute pressure of the new advance of material civilization upon the followers of an ancient calling, brings to the most accustomed observer of the new development in gas supply a freshened sense of what is going on.

WATER AND SANITARY AFFAIRS.

WHEN the time comes for the London County Council to re-open the discussion of the Water Question, with the view of securing support for their Welsh scheme and their other projects in regard to the Water Companies, attempts will in all probability be made, as on previous occasions, to show that the present sources of supply are not only inadequate to the demands upon them, but altogether unfit when regarded from the standpoint of quality. The water of the Thames will be once more characterized as "liquid "sewage;" and it will be contrasted with the purer supplies of other large towns—say Glasgow and Birmingham. As to inadequacy, it may be sufficient to state that the supply furnished by the Companies last month was at the rate of 251 gallons per service; and, reckoning seven persons to a service, this is practically 36 gallons per head—surely sufficient for all ordinary requirements. On the score of quality, the latest reports of the Official Examiners—Dr. Percy F. Frankland, by special request, for the Registrar-General, and Sir William Crookes and Professor Dewar for the Water Companies—afford the amplest proof that it is excellent. According to the former, the amount of organic impurity in the waters drawn from the Thames and Lea last month was 4·1, taking the Kent Company's average for nine years as unity; whereas those actually supplied to Glasgow and Birmingham contained 4·9 and 5·8 respectively—more than twice as much as that in any of the waters sent out by the London Companies, which were in every case clear and of high chemical quality. Dr. Percy Frankland testifies to the great value of the two purification processes of storage and filtration employed by the Companies, as evidenced by the very small number of bacteria found in all the samples of the filtered water. Equally satisfactory is the report of Sir William Crookes and his colleague. They state that during the past month the unfiltered waters of the Thames, the Lea, and the New River were specially characterized by their "extraordinary" bacterial purity as compared with August. The adjective is certainly justified by the figures given by them. In the latter month, the microbic impurity of the Thames was 2269 per cubic centimetre; whereas in the past month it was reduced to 574. In August, the figures for the Lea and the New River were 863 and 410; while in September they were 220 and 170. As the raw water was so much better, it was necessarily of a higher quality when filtered. Opportunity is taken by these two distinguished chemists to emphasize the fact, which they have pointed out over and over again, that purification by storage and regulated filtration has become so effective that the quality of the distributed water is now practically independent of variations in the microbic impurities which occur in the course of the year in the respective sources of supply. A great deal of importance is attached at the London County Council to Dr. Koch's "standard" of 100 microbes per cubic centimetre. There is doubtless much virtue in a standard; and we are very glad to find that the Water Companies' storage and filtration plant is capable of producing for distribution water which, on an average, comes within the limit Dr. Koch has laid down. Such a result, we are told, is regarded by the highest authorities as "eminently satisfactory;" and it is exceedingly gratifying to be assured that such a water has never been known to cause a water-borne disease. Sir William Crookes and Professor Dewar conclude their report by stating that, on the whole, the quality of the London Water Supply has rarely, if ever, been so good as it was during the past month; and for any person, "professing to be conversant "with the question of water supply," to talk at the present day of the drinking water of London as a "limited "supply of diluted sewage in place of fresh water," is to indulge in a misrepresentation of facts which, they justly say, cannot be too strongly condemned. Yet the Water Committee of the London County Council are not satisfied with the present system of examination, and wish the Local Government Board to institute daily tests of the water.

Satisfactory as it unquestionably is to receive the assurance of the above-named authorities that the waters of the two rivers upon which the inhabitants of London mainly depend for their supply are of this excellent quality, it will require a great deal of such testimony to dispel the objection—it may be a sentimental one—to water drawn from sources which are liable to contamination by sewage. The Thames and Lea Conservancy Boards are alike anxious to keep the streams under their control as free as possible from pollution, and their officers are vigilant in securing the punishment of offenders. But cases occasionally arise which cause the public to regard Thames water with some suspicion; and therefore every fresh instance of diversion of sewage from the river should receive due recognition and encouragement, because, as pointed out by Sir William Crookes and Professor Dewar, the purer the raw water, the better will be the quality of that which is distributed. Last year, thanks to the action of the Thames Conservancy, no fewer than 78 towns or villages, having an aggregate population of upwards of 180,000, diverted from the river and its tributaries pollution which at the beginning of the year was passing into them; and consequently it must have been a source of gratification to

Sir F. Dixon-Hartland, M.P., the Chairman, to formally open, on the 14th inst., the new sewerage and sewage-disposal works which have been carried out at Hampton by the District Council, at a cost of £62,000. They have been constructed upon the bacteriological system of Mr. W. J. Dibdin, formerly Chemist to the London County Council, the advantages claimed for which are that no expense is incurred for chemicals, and that no sludge remains after the sewage is purified. The effluent is clear water, which analysis shows to be free from suspended matter and entirely devoid of offensive odour. Sir Frederick expressed the hope that many other districts in the valley of the Thames would follow the example of Hampton; and if we do not arrive at the happy state foreshadowed by him, of seeing salmon returning to the river, we shall at least be conscious that efforts are being made to render it fit for their habitation. And while on the subject of sewage disposal, attention may be directed to the important investigations which have been carried out by Mr. Dibdin's successor at the County Council—Dr. Frank Clowes—in conjunction with Dr. A. C. Houston, on the treatment of the Crossness crude sewage by means of coke. The results obtained by them are embodied in a valuable report, which has lately been published, some extracts from which are given in another part of the "JOURNAL." It is found that the effluent from a single bed of coke is better chemically than that produced by precipitation; and though the bacteria present in it are not perhaps desirable in a potable water, they nevertheless effect a good purpose, inasmuch as they carry on the purification process in the river itself.

Turning to the Lea, notwithstanding the good character given to its water in the Examiners' reports already alluded to, a strong feeling exists that the river should be rendered absolutely free from sewage pollution—that, in fact, it should never have been employed as a receptacle for the best effluent a sewage farm is capable of producing, much less as a carrier of sewage; but there has been uncertainty as to the exact measures to be adopted to attain this much-desired end. The Engineer to the Lea Conservancy Board—Major Lamorock Flower—whose paper on the subject of the pollution of rivers, read at the recent Congress of the Sanitary Institute was noticed in the "JOURNAL" for the 3rd inst., has done everything in his power to overcome the difficulty, but apparently with little success. A suggestion was made some time since that all the districts concerned should combine, and construct a main sewer to the coast; and a conference on the matter was held about a year ago. Nothing, however, seems to have resulted. An opinion prevails in certain quarters that there should be a reconstitution of the Board; and, in all probability, some steps will be taken in this direction next session. In the meantime, an arrangement has recently been concluded which should tend at all events to allay some of the ill-feeling that has been engendered over this question. We learn from the "British Medical Journal" that an agreement has been entered into between the Corporation of Hertford and the East London Water Company by which the sewage works of the former are leased to the latter for thirty years, with power of extension for a like period, if desired, at an annual rental of £1; the Corporation paying £700 per annum, with an additional £100 when the population exceeds 15,000. The Company will efficiently treat and dispose of all the sewage sent into the works, and take over the duties and liabilities of the Corporation in connection therewith. The effect of the arrangement is that the Corporation are relieved of a matter which has always been a source of anxiety, while the Company assume a direct share in the burden of keeping free from pollution a river from which they have acquired the statutory right to draw a large quantity of water. We do not, for the moment, remember any similar arrangement; but we think, with our medical contemporary, that it cannot be unsatisfactory to those who are directly interested in securing the purity of the Lea throughout its course.

Raw Petroleum Production of Roumania.—In the twelve months ending December last, Roumania produced about 240,000 tons of raw petroleum; and it is confidently expected that this year the output will exceed that of Galicia. As the price of Roumanian raw petroleum is only about £8 per waggon of 10 tons, it is not improbable that with time it will enter into successful competition with the American and Russian petroleum in the German markets.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1009.)

THE course of business on the Stock Exchange last week was rather interesting. The markets opened very cautiously; and things were so quiet that they did not in the least clash with a general adjournment to the Guildhall. The tendency afterwards continued rather shifty, and on Wednesday became decidedly flat—being startled by the calling out of the Militia reserve. Dulness ruled until the intelligence of the Glencoe victory cheered every heart. A smart rebound took place at once in pretty well everything; and this continued right up to the close. It is likely to last, too, for the dealers are well aware that there are any number of people awaiting what they think is the right moment to buy; and when they do come in, they will probably be made to pay a price. Money has been in extreme abundance all the week; and short loans could be had on very easy terms. Discount rates, however, did not lighten much; caution against commitments too long ahead being the rule. In the Gas Market, business was still very quiet, though not so phenomenally calm as in the preceding week. The chief feature of the week is that there was hardly any change at all in quotations. One or two of the undertakings in remote parts have moved; but the great Home and Continental Companies are absolutely without a rise or a fall. In Gaslight issues, the ordinary was moderately dealt in—prices ruling rather easy at first, and as low as 103½ on Tuesday. But thenceforward there was a better tendency; and 105 was touched once or twice—the closing mark being at that figure. The secured issues were moderately active at good middle prices. In South Metropolitan there were a few transactions at very moderate figures, with no tendency at all to improve. Commercials were very quiet; and they made no particular sign. The Suburban and Provincial undertakings were not far removed from absolute stagnation; just a deal or two here and there being marked. Business in the Continental Companies was quite torpid; and the prices at which they changed hands did not point to increasing firmness. The minor undertakings, as already observed, alone underwent any chance; Hong Kong and River Plate being gainers, while San Paulo had a further fall. The Water Companies exhibited more variation; but movements were irregular. Kent, Lambeth, and West Middlesex receded; but Southwark rose.

The daily operations were: Very quiet business in Gas on Monday; and all issues unchanged in price. Kent Water fell 2. Tuesday was more active, especially in Gaslight ordinary. San Paulo dropped ¼. In Water, Kent receded 3, and West Middlesex 2. On Wednesday, Gas relapsed into quietude, and was unchanged. Lambeth Water fell 2. On Thursday Gas was still quiet and unchanged. In Water, Southwark rose 2; but Lambeth moved back 3. On Friday there was more activity in Gas, mostly in Gaslight issues. Hong Kong rose ½, and River Plate ¼. Saturday was very quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

Krugerism among the Municipalities—Impracticability of the Idea—The Example of the Niagara Scheme—The London County Council and Dr. Kennedy.

THE Association of Municipal Corporations appear to have taken a leaf out of the book of the Transvaal Government, and to be bent upon establishing the principle of "independent sovereignty" in regard to the electricity supply undertakings of Local Authorities, against the "suzerainty" reposed in the Board of Trade by the Electric Lighting Acts. This is giving a "topical" rendering of the proceedings of the Association at last week's meeting, when a resolution was passed declaring that "where Local Authorities have, with the sanction of Parliament, established, or are in course of establishing, undertakings for the public benefit, and have not failed in the performance of their duties, it is not right or expedient that any similar powers should be granted to Companies within the areas of such Local Authorities." This declaration is directly opposed both to the language of the Electric Lighting Act, 1882, and to the recommendation of the Parliamentary Committee on electricity-in-bulk generation and distribution. The municipalized mind has never liked this statutory and parliamentary encouragement of competition in electricity supply, when the undertaking happened to be in the hands of the Local Authority, and has repeatedly attempted to shake off the absolutely discretionary power of the Board of Trade in this respect by passing resolutions. Let us hope that the analogy we have used to illustrate the position will not carry much farther. At any rate, the Associated Municipalities may rest satisfied that something more than resolutions will be required to get rid of their bugbear, safely ensconced as it is in law and practice. Parliament is not growing so increasingly enamoured of municipalism in action that it is likely now to remove the only safeguard of the consumer's interest against municipal monopoly. As the "Pall Mall Gazette" has remarked on this very resolution, "a monopoly is none the more tolerable, as a rule, because it is owned by the borough

corporation, instead of by a company; and in the case of many gas and water undertakings, it is much more costly to the consumer." From which it may be gathered that the public are beginning to awake to the perception that when Local Authorities add trading enterprises to their administrative functions, they are not likely to prove better or worse than other traders. At any rate, there is no adequate reason why they should be superior to the laws applying to other traders.

Obviously, the Associated Municipalities desire to stop by proclamation any realization in this country of what may be briefly called the Niagara type of electricity generation and distribution. It is not evident why they should be permitted to do anything of the kind. The preamble of this electrical development, in the abstract, has been passed by Parliament; and while it is open to any Municipality interested in a particular scheme to show cause against it, on the merits, this is the utmost that either law or public policy allows. The possible future of electricity supply is not to be that of bondage to municipal interests, which are not necessarily those of the consumer or the general public. Even if this were otherwise, and the Local Authority and the inhabitants of its area were never divided, it would still be a piece of impertinence to pretend that every such authority ought to have the monopoly of electricity generation and supply. Manchester might think so, perhaps, with some show of justification; but what of the little District Councils next door? It would be impossible to make any distinction. What is sauce for the Manchester goose, must be sauce for the Chorlton-on-Medlock gander.

It is a piece of supererogatory fussiness for the Association of Municipal Corporations to indulge in this mild form of Krugerism. The immediate prospects of any possible schemes for the generation and distribution in the United Kingdom of electricity in bulk, in the Niagara style, are not promising; and the idea has yet to be embodied in a practicable shape. It is undoubtedly interesting, as an idea; but it goes no farther for the present. Professor G. Forbes has recently reported, from personal inspection, that the Niagara scheme is going particularly strong, and that there are no technical troubles in the way of profitable business. There is a large and increasing demand for electricity, chiefly for electro-chemical purposes; and the willingness of manufacturers to set up factories in the vicinity is taken as a proof that the system of supply is successful, and the choice of the situation of the new industrial centre wise. The demand, in short, justifies the supply. All this is very gratifying to the sponsors of the scheme, and to their professional advisers; but it leaves the commercial aspect of any British copy of the venture, with steam instead of water as the source of power, exactly as it was before.

At last week's meeting, the London County Council took the first step towards the creation of a Metropolitan electric tramway or light railway system, by agreeing to the appointment of Dr. Kennedy as Engineer in charge of the development in question. The County Council have progressed a long way from the opinion of the value of competent professional advice sought to be imposed upon them by Mr. John Burns—that no man's services could be worth more than £500 a year. It was complained on this occasion that Dr. Kennedy's remuneration under the agreement would run to £30,000, which is a pretty substantial fee. But, on the other hand, there was no gainsaying the conclusion that the adaptation of the existing and proposed Metropolitan tramways to electric traction is a big business. Sir A. Binnie, the Engineer to the Council, absolutely refused to undertake this additional burden; and his recommendation of Dr. Kennedy as a thoroughly reliable Engineer for the work is unimpugnable. One scarcely knows whether to compliment Sir A. Binnie the more upon his discretion and judgment, or London on the selection. Dr. Kennedy once described an engineer as a man who is always being required to make up his mind upon a course of action. As an Electrical Engineer, it is pretty evident that Dr. Kennedy has come very well out of this test of engineering capacity. Not many men in this new branch of the profession have made fewer mistakes. He is not altogether to be envied the openings for redressing his average in this respect which the responsibilities of his new office will bring. He is a level-headed man, not at all prone to be captivated by impossible projects; but what an avalanche of schemes of mechanical traction will descend upon him from this time forward! It may not be a wasted hope that before Dr. Kennedy makes up his mind concerning the means of working the new tramways or light railways—for it seems a little doubtful to which category the new lines are to belong—he will give one more thought to the self-contained gas-power car.

Midland Association of Gas Managers.—According to the programme of the autumn meeting of the Association, which has been issued by the Hon. Secretary (Mr. C. Meiklejohn, of Rugby), the business next Thursday will include a paper on "Heating Gas-Retorts," by Mr. G. Helps, of Nuneaton; and another on "Inclined Retorts," by Mr. B. W. Smith, of Smethwick. After luncheon, the members will proceed by train to the latter town, where, by the courtesy of the Gas Committee of the Corporation, and on the invitation of Mr. Smith, they will have an opportunity of seeing in operation the installation of inclined retorts described in his paper, as well as the coke-conveyor in process of erection.

THE BLUE-BOOK OF THE METROPOLIS GAS (POWERS OF CHARGE) COMMITTEE.

Second Notice.

The first notice of the complete report of the Committee, in last week's "Journal," dealt with the composition of the body, the attendance of the members, and the way in which the recommendations received their final form. We now propose to trace the course of the inquiry, as it took shape amid the statements of the witnesses, and under the questions (more or less pertinent) of the members, who had to do their own examination and cross-examination of the witnesses. The Committee must be imagined as coming to their work with open minds, and at least in the instance of some of the members, as absolutely innocent of exact knowledge of the subject-matter to be laid before them. To them enters the chief depositary of official knowledge, in the person of Sir Courtenay Boyle, Permanent Secretary of the Board of Trade. He brought in a Memorandum supplementing and bringing up to date the information contained in Lord Farrer's celebrated Memorandum of 1876. Both papers are given in the appendix. We naturally only mentioned the existence of these official papers in our condensed report of the proceedings of the Committee. Sir Courtenay Boyle's own Memorandum begins with a succinct account of the agitation which led to the appointment of the Committee; and the official author has ascribed the whole proceeding to "the differential prices charged by the three Companies." It was always this difference that caused popular discontent. In 1875, the dissatisfaction on this account was so acute that Parliament was invoked to supply a remedy. The result was the enactment of the sliding-scale of price and dividend, and the statutory encouragement of the policy of amalgamation of the London Gas Companies, whose difference of price was accentuated by their number and the contiguity of their districts.

The immediate effect of the amalgamations was grouping of the Companies under the three leading organizations of the Gaslight and Coke, the South Metropolitan, and the Commercial undertakings. Up to 1889, it seemed that the policy of amalgamation was going to operate in the desired direction of levelling down the prices of gas in the Metropolis. In that year, the prices charged were: Gaslight and Coke, 2s. 6d.; Commercial, 2s. 4d.; South Metropolitan, 2s. 3d. As the Memorandum remarks, "these prices are the nearest approach to uniformity of price attained during the whole period from 1876 to the present time." Subsequent to 1889, all three Companies found it necessary to increase the price, "owing mainly to increased cost of coal and labour troubles." The net result of this change has been that at the beginning of the tenth year from the critical period, the Gaslight and Coke Company were found to be charging 6d. more, the Commercial 2d. more, and the South Metropolitan 1d. less than the ruling prices of 1889. Tables are given showing the comparative prices of London gas with those of Companies working under the sliding-scale at other large places; the prices charged by non-sliding-scale companies; and those charged by Local Authorities. The bulk of Sir Courtenay Boyle's evidence consisted of explanations of the Memoranda and tables, with a patient instruction of the members of the Committee in the nature and operation of the sliding-scale. He testified that the popular agitation which had led to the inquiry was confined to the question of selling price, and recorded the satisfaction of the Board of Trade with the existing statutory arrangements.

Sir Courtenay Boyle was asked pointedly and repeatedly about a sinking fund, presumably for the reduction or extinction of the capital of the Companies. This question, put so early in the inquiry, is of interest in connection with the definite but limited recommendation of the Committee on the subject. There was no official opinion regarding the sinking fund to be expressed. With regard to the payment of deficiencies of dividend out of reserve funds, Sir Courtenay Boyle raised a point, which he declined to pronounce upon, as to whether this proceeding is in certain circumstances an avoidance of the intention of the sliding-scale provisions. In the course of his examination by individual members of the Committee, Sir Courtenay Boyle had to answer the question, put by Mr. Lowles, as to whether the tendency of gas prices to rise from 1889 to 1894, and then to decline to their former level, was due to a common cause or to local causes. Witness thought there must be a common cause for the decline. Then came the query why the same causes should not have operated in the case of the Gaslight and Coke Company. There was no answer. Another curious query, respecting the obligation of the Gaslight and Coke Company to sell gas south of the Thames at the current South Metropolitan price, comes out in Question 96 and the questions immediately following. Witness was asked if any precedent existed for this notorious clause; and the answer was in the negative. Asked whether the effect was not to make the price in the northern district of the Company higher, witness could only admit that the contention is "arguable," but mentioned the highly important consideration that when the obligation was put upon the Company "the difference was only 4d. practically, whereas the difference now is 10d." At the close of his evidence, Sir Courtenay Boyle laid stress again upon the view taken by the Department that "the two great questions [for the Committee] are whether

it is possible to get uniformity of charge all over the Metropolis, and why it is that there are such wide differences of charge." This appeared to be of the nature of a warning to the Committee not to be led astray into hunting up minor complaints—such as the favourite London County Council hobby of the inadequacy of the statutory testing arrangements.

With the appearance in the witness chair of Mr. H. E. Haward, the Comptroller of the London County Council, the investigation entered upon a livelier stage. This important witness had also come with what the Chairman called a "most elaborate statement," a copy of which only reached Sir James Rankin at 12 o'clock on the night before the author appeared in its support. The copy was described by the Chairman as a "pamphlet;" but if the statement was properly so described, it has not been printed in its entirety in the appendix. There are some tables of gas prices ascribed to Mr. Haward, and also a Memorandum showing how the London Gas Companies are rated; but certainly nothing like a "pamphlet." Some discretion is evidently exercised by those responsible for preparing these Blue-Books, as to what goes into the appendix in addition to the witnesses' oral statements. Mr. Haward began by filling in the details to Sir Courtenay Boyle's sketch of the history and causes of the existing gas legislation affecting the London Companies. He pointed out that up to 1860 the Metropolitan Companies were regulated by the Gas-Works Clauses Act, 1847, which allowed maximum 10 per cent. dividends, the payment of back-dividends, the making up of a reserve fund to one-tenth of the amount of the nominal capital—all before reducing the price of gas. But these arrangements were originally applied to Companies some of whom were in active competition with each other. Then came the districting agreements, which, said Mr. Haward, were followed by very high charges for gas. The Metropolis Gas Act, 1860, was passed to remedy this state of things; but it proved insufficient, and the agitation went on. Mr. Haward gave an interesting narrative of the circumstances in which the fatal figure 3s. 9d. per 1000 cubic feet came to be regarded as the fair price for common gas in London. At the same period (1867), Mr. Cardwell's Committee recorded their conclusion that the Act of 1860 had proved more favourable to the Companies than to the consumers, who had been "very inadequately protected." Witness insisted upon the importance of the principle accepted by this Committee, that the Companies should have "a reasonable prospect of attaining from time to time, *with due care and management*, the maximum dividend." The results of the inquiry by this Committee were embodied in the Companies' Acts of 1868 and 1869. The Gaslight and Coke and Imperial Companies got a 3s. 9d. maximum price, subject to powers of revision, for 16-candle gas; the South Metropolitan maximum price was 3s. 6d. for 14-candle gas. For some years, thereafter the price of gas in London was liable to be fixed by a Commission, appointed by the Board of Trade. It was something like the Paris plan, which is not surprising, as French things were all the rage just at that period. The machinery, however, did not work satisfactorily, in the opinion of the Metropolitan authorities; and accordingly a fresh agitation arose, which culminated in the parliamentary proceedings of 1875-76. Here the sliding-scale first emerges from the welter of gas regulating schemes; but this subject must be matter for another article.

THE SETTLEMENT OF TRADE DISPUTES BY COMPULSORY ARBITRATION.

Our Australasian Colonies have been aptly described as the political laboratories of the empire; and in no department of politics have they made so many or so instructive experiments as in that embracing industrial problems. In this respect, New Zealand is the most enterprising and "progressive." She is at present making three experiments of special importance; having, in the last five years, granted the suffrage to women equally with men, instituted a scheme of old-age pensions, and established compulsory arbitration for the adjustment of labour disputes. The first experiment, however intrinsically interesting, does not fall within our province to discuss; the second is but recently commenced, and of its success or failure no satisfactory evidence can be obtained for some years to come; but the third has now had a five years' existence, and a consideration of its effects may be instructive, as well as interesting.

The provisions and results of the Industrial Conciliation and Arbitration Act of New Zealand are fully explained and discussed, in the "National Review" for October, by the Hon. J. MacGregor, a member of the Legislative Council (N.Z.), in a very able article entitled "Compulsory Arbitration at Work;" and we can heartily commend its perusal to our readers—especially to those employers who are wont to bemoan the influence and tactics of Trade Unionism in England as if they alone of all employers had to contend with such troubles. It will certainly dispose them to be more thankful for the mercies vouchsafed to them, and to bear with greater fortitude the ills they have. One has been sometimes disposed to ask whether trade in this country were controlled by the employers or by the Unions. In New Zealand it is not a question; Trade Unionism is practically supreme. Mr. MacGregor's article, as we have said, will well repay careful reading; but we will endeavour to indicate some of the most striking features in his analysis of the Act and its actual working.

The Act—whose very title was ominous: "An Act to encourage the formation of Industrial Unions and Associations, and to facilitate the settlement of Industrial Disputes by Conciliation and Arbitration"—was passed in 1894; and the following are its main features, as sketched by Mr. MacGregor.

For the purposes of the Act, the Colony is divided into districts, and a Board of Conciliation is constituted for each district, whilst one tribunal—a peripatetic Court (of Arbitration)—is set up for the whole Colony. The Boards of Conciliation consist of five members each—two elected by the Trade Unions registered under the Act, and two by the registered Unions of employers—with a Chairman (elected by the other members) who is to be "some impartial person, not being one of their number, and willing to act." . . . The Court of Arbitration consists of three members—two appointed on the nomination of the Unions of employers and workmen respectively—and a President appointed by the Governor in Council. The President must be a Judge of the Supreme Court. . . . To have any *locus standi* under the Act, Unions (whether of workmen or employers) must be registered. Of disputes between individual or unorganized workmen and employers, the Act takes no cognizance.

An "industrial dispute" may be referred to the local Board of Conciliation either by the Union (of workmen or of employers) or by an individual employer. . . . A meeting of the Board is thereupon fixed, and notice thereof given to all the parties to the dispute, comprising all the employers in the particular trade carrying on business within the district. After hearing the evidence adduced by the party instituting the proceedings (which is invariably a Trade Union), and by such of the other parties as choose to appear, the Board has to "decide the question according to the merits and substantial justice of the case, and make their report or recommendation in writing." . . . The proceedings are then adjourned in order to afford the parties an opportunity of making up their minds whether to accept the recommendations of the Board or not.

If the recommendations be accepted by both sides, they are embodied in an Industrial Agreement, which remains in force for a period not exceeding three years, is binding on all parties thereto, and, when filed in the Supreme Court, can be enforced, under penalties not exceeding £500, upon all such parties. Failing such acceptance, the dispute may, on the requisition of either side, be referred to the Court of Arbitration.

In this way, a Trade Union, by simply deciding not to accept the recommendations of the Conciliation Board, can force all the employers of the district in the particular trade into the Court of Arbitration, and can demand a decision of the Court on any question relating to the employers' method of managing their business.

The Court of Arbitration, having heard the evidence, makes an award, which is enforceable by fine or imprisonment! Somewhat of a contrast, is it not, with our permissive Conciliation Act? The mere suggestion of such a measure will, we fancy, leave some of our readers gasping.

What have been the results of the Act? First, we are told, it has resulted—as might have been expected—in the manufacture of "disputes" upon trivial points by the Trade Union officials, in order to bring the employers into Court for the purpose of dictating to them, through the Court, as to the management of their business—

The Act is being ridden to death by Trade Unions. . . . As a rule, the men supposed to be involved in the dispute know nothing of its existence until they learn from the newspapers that the Board of Arbitration is to sit to hear the case.

The intention of the Act was to promote the settlement of disputes by means of Conciliation Boards; the compulsory Arbitration Court being provided to induce the mutual acceptance of the conciliators' terms. In actual practice, however, 23 out of 31 disputes have been carried to the Arbitration Court; a result due, says Mr. MacGregor, to the fact that "there is only too much reason to believe that, from the first, Trade Unionists regarded the measure. . . . as an instrument of coercion. As to its failure as a means of conciliation, there is little doubt; and the Trade Unions are glorying in the fact."

The second and chief result of the Act is, then, that of immensely strengthening the Trade Unions, and making them virtual masters of the trade of the country. A further, and consequent, result is that "there is undoubtedly less good feeling now between employers and employed than existed before the Act." A measure intended to promote conciliation has, therefore, only resulted in the increase of disputes and the embittering of relations between the parties to be conciliated. The Act, it will be seen, has become practically a measure for settling trade disputes by compulsory arbitration. The interesting question for us is whether such a method is a possible one in any other country. On that point Mr. MacGregor says:

To prove that compulsory arbitration presents a feasible method of settling industrial disputes, it is necessary to show, not only that the awards of the Court can be legally enforced, but that this can be done in such a way as not to produce in the public mind an impression of unfairness and one-sidedness.

How does the Act in question stand this test?

With a view to the enforcement of an award, the Court of Arbitration may order it to be filed in the Supreme Court, and thereupon it becomes enforceable as if it were a judgment of that Court. If the award order the payment of a sum of money by the employer, a writ of sale may be issued against his property; if the award order something else—as, for example, that the employer is to give a preference to members of the Union over non-members [an award actually made in one case!]—the order can be enforced by sending him to gaol in case of disobedience. But what about the other party—the Union? The Union is not liable to attachment; and the members of the Union are not parties, and are, therefore, not individually liable.

Pecuniary penalties are enforceable upon Unions—if they have any funds to seize, and upon the individual members—if they possess the wherewithal to pay! Could any measure more

unfair and one-sided be conceived? No writs of attachment have actually been served on employers under the Act; but three applications for the issue of such writs have been made, and failed merely on technical grounds. We have only space to quote the grounds of application in one of these cases. The charge against the employer was that he had been guilty of "a breach of a clause of an award fixing the minimum wage of journeymen bakers at £2 10s. a week. The employer's answer was that, an improver having left his service, a journeyman, who had been out of employment for ten months, and was on the verge of starvation, was taken on in the improver's place at the same wages—£1 12s. 6d. a week." For this the employer was to be sent to gaol, and the man to be turned adrift! It is a pity a writ was not issued in this case. As Mr. MacGregor says, it is scarcely conceivable that a system under which such absurdities could be perpetrated could have long survived.

Tyrannical in working as the Act is, the Unions are, it seems, not even yet satisfied; for they endeavoured to get incorporated in an Amending Act last session provisions which would have still further placed employers at their mercy. One suggested clause, among others, would have declared it a breach of duty for an employer to discharge a workman because he was a member of a Trade Union, and have laid upon the employer the onus of proving that the discharge of the workman did not constitute such breach of duty. It was stated in debate that the clauses in question had been declared by the President of the Arbitration Court to be required to make the compulsory provisions of the Act effective. "If," says Mr. MacGregor, "such provisions are necessary for the working of compulsory arbitration, then nothing more need be said to show how hopeless the case is."

In conclusion Mr. MacGregor says:

> According to a cablegram received in the Colony some months ago, one of the leading London Dailies described the New Zealand system of compulsory arbitration as "a beacon to the world." A beacon, no doubt, serves a useful purpose; but it usually is to give warning of the proximity of danger, and the expression is much more applicable in that sense than in the sense in which it appears to have been used. Outside the ranks of the Trade Unions and their agents and representatives, there are few who would advise any other country to run the risk of introducing such a system. . . . If the New Zealand system can be said to have any value to other countries, it is as a beacon warning of danger, and not as a pattern to be imitated.

We think we have quoted sufficient of Mr. MacGregor's most interesting and able paper to enable our readers to thoroughly endorse his conclusions, and to send them to the original article for a whole armoury of weapons wherewith to defeat any proposals, should such ever be seriously made, for introducing a scheme for the compulsory settlement of labour disputes in this country. We are fully alive to the evils of the system of strikes and lock-outs for adjusting differences between employers and employed; but we have no desire to jump out of the frying pan into a particularly hot fire.

NEW EDITION OF NEWBIGGINGS ON RATING.

The appearance of a Second Edition of the Messrs. Newbigging's work on the "Valuation of Gas, Electricity, and Water Works for Assessment" is to be welcomed.* Time flies; and it is almost with a shock that one receives the authors' reminder that the first edition of their valuable book on this abstruse subject appeared in 1891. It is almost superfluous to remark that this is one of the books which are professional men's tools, and are consequently indispensable. The valuation of gas-works for assessment is one of the most highly artificial exercises which the conditions of modern industrial development have attached to the simple old rule of determining the annual value of an hereditament by reference to what a yearly tenant would pay for it. This valuation is a task for which most practical gas-works managers entertain a profound distaste. They would gladly let the whole subject alone; but unfortunately this is impossible. The works manager has to make the money to pay the rates, which are always getting heavier; and though he always prefers to have the guidance of experts in his dealings with the assessment authorities, he feels it incumbent on him to understand a little of how the valuation is done. An additional recommendation of Messrs. Newbigging's handy guide is the fact that next year is the quinquennium for the Metropolis valuation, for which the London County Council and the various London Local Authorities, new and old, have made their preparations. Though there is no such fixed period for the revision of the valuation of provincial towns, the desirability of this proceeding is becoming better appreciated by the authorities interested; and consequently assessment is always on hand somewhere.

The law of valuation is perfectly clear, and never gives rise to any dispute. The great bulk of rateable property is valued with little trouble, though when the interesting operation of the re-assessment of an entire Union is taken in hand, the atmosphere of the locality usually becomes sulphurous with the terms of owners' and occupiers' complainings of injustice. The chief source of uncertainty, serious enough to lead to litigation, is what are classed as "special properties." As the Valuation (Metropolis) Act has it, these properties—among which are included gas, water, and electric light works—must be appraised according to the circumstances and the general principles of law. This is where the margin for disagreement between owners and rating authorities is provided—as it were, for the delectation of professional valuers; because, as Messrs. Newbigging point out, the interpretation of the law is so greatly influenced by the circumstances of particular cases, that no general agreement as to the proper treatment of the essential elements is possible. As regards gas undertakings, nobody can say off-hand what is a fair assessment, or how it should be arrived at in order that justice shall be ensured as between the parties. Indeed, the authors positively state that all methods of establishing a comparison between the ratings of different gas-works, with the object of showing fair or unfair treatment, are misleading. "There are no two undertakings similarly situated; and trustworthy comparisons are almost impossible."

It is intended by the Legislature that all rating shall be equal; and it is enacted that the rating shall be on the rental value of the hereditament, not on trade profits or personal property. This is the fundamental characteristic of rating which has to be kept in view, if the subject is to be understood. It is also the most difficult point to realize in regard to the determination of the rateable value of a gas-works. The matter is not rendered clearer by the circumstance that, while in one breath the expert tells us that rating is a question of rental value, not of trade profit, in his next he proceeds to describe the process of assessing a gas-works as beginning with the ascertainment of the gross income, from which the expenses are to be deducted. Thus we get at the net receipts. But what are these except trade profits? Something very different, which appears when we are reminded that the rental value to be determined is purely a calculated sum, which can only be got at through the net receipts. These receipts constitute the fund out of which an imaginary personage, known to fame as the hypothetical tenant, is conventionally supposed to pay his rent, while keeping something for himself for his trouble. Messrs. Newbigging discourse in the clearest way upon the successive stages of the investigation which lead to the settlement of the landlord's proportion of the receipts, and hence to the rateable value.

The authors next proceeded to defend the system against those who would have it changed for assessment based on the structural cost. This they do easily; but they have a more difficult task in showing that the existing system is not a rating of profits, and consequently an exception to the rule of the law. Seeing, however, that the rent, or landlord's share, which the hypothetical tenant is supposed to be able to pay for the use of the hereditament is arrived at by a process of "washing-out" from the net receipts, it is hard to admit that the rating does not depend in the last place upon the profits. If so, then the profits are rated, albeit indirectly. The rent is a residual of the net receipts. The question, however, is an academical one for the present, and is not fitting to be discussed in a notice of a book of practice, which only deals with theories incidentally. Whenever it is threshed out, the point made by Mr. Livesey, that "heavy rating usually accompanies heavy charges for capital, thus doubly punishing the consumers," will come into prominence. For the rest, suffice it to say that the present book is a completely trustworthy explanation of the actual practice, so thoroughly brought up to date that the possible corrections due to the introduction of coin meters, to the unrest of labour, and other sources of disturbance of the average, are considered. A number of leading cases are given in an appendix.

* "The Principles and Practice of the Valuation of Gas, Electricity, and Water Works for Assessment Purposes." By Thomas Newbigging and William Newbigging. Second Edition. London: Walter King; 1899.

LASS'S ANALYSIS FOR 1898-9.

Our readers will doubtless remember that the principal instruction to the present Royal Commission on Water Supply was to inquire whether, having regard to financial considerations and to present and prospective requirements as regards water supply in the districts of the Metropolitan Water Companies, it would be desirable, in the interests of the ratepayers and consumers, that the Companies' undertakings should be acquired and managed either by one or more authorities; and, if so, what such authority or authorities should be. The answer to this question is just now being anxiously awaited. In the event of purchase being recommended, the financial position of the undertakings concerned will be invested with additional interest, and the accounts of the Companies will possess an attraction unusual in such dry compilations. As presented in the customary Parliamentary Paper, they furnish a great deal of information, of a kind; but, in order to arrive at the full meaning of the figures presented, an investigator requires the assistance of someone in the habit of manipulating statistics. Such help will be afforded by the work mentioned above, the nineteenth annual edition of which has just been issued by Messrs. Lass, Wood, and Drew.* In the years which have elapsed since its first appearance, it has become firmly established as the recognized book of reference on Metropolitan water-supply statistics. But, with the view of increasing its usefulness, the compilers

* "An Analysis of the Accounts of the Metropolitan Water Companies, and of the Corporation Water Undertakings of Edinburgh, Glasgow, and Manchester, for the Year 1898-9." Compiled by Messrs. Lass, Wood, and Drew, Chartered Accountants. London: Walter King; 1899.

have in the present edition made some important additions to the details hitherto furnished; and to these we will briefly direct attention.

Taking first the rates of supply authorized by the Acts of the Water Companies, these are now shown in tabular instead of narrative form; so that all the information on this point can be obtained at a glance, and the charges of each Company compared with those of its neighbour. Another feature of the present edition is the reproduction of the map prepared for the first issue by the late Sir Francis Bolton, at that time Official Water Examiner under the Metropolis Water Act, 1871. It shows the parliamentary limits of each Company; and it is interesting to notice how the districts supplied by the various Companies, with the exception of the East London, appear to overlap the areas granted by Parliament. The usefulness of the "Analysis" has been further increased by the inclusion of the accounts of the water undertakings of the Corporations of Edinburgh, Glasgow, and Manchester, which have been supplied to the compilers, who entertain the hope that in course of time the accounts of other large municipal water undertakings will be added. Unfortunately, the municipal accounts are not subject to the same uniformity of arrangement as are those of the London Water Companies; and consequently it has not been possible to show the cost of maintenance and the working expenses in the same detail. The Metropolitan Companies have higher rates of charge than the Municipalities whose accounts are dealt with; but, on the other hand, they have to meet a much heavier expense for obtaining and pumping the water they supply. The cost of maintenance and management is 43¾ per cent. of the income in the case of London; whereas it averaged about 23¾ per cent. in the case of the three Corporations. The other new feature to be noticed is an index referring the reader to every item contained in the statistics.

It may be of interest to close with a few extracts from the tables. We find that the total amount of capital authorized in respect of the supply of water in London is £20,492,252, of which £17,941,205 has been expended on works which furnished, in the twelve months covered by the accounts, 74,472,193,554 gallons of water; being at the rate of £241·23 per million gallons. The average daily supply for domestic purposes only was 157,452,692 gallons; for all other purposes, 46,580,715 gallons. The average number of houses supplied during the year was 862,876; and the population served at the close of 1898 was 5,875,003—the average daily supply for purely domestic purposes being 184 gallons per house and 27·45 gallons per head of the population. For all purposes, however, the figures are 236 and 35·08 gallons. The number of houses on constant service last December was 795,241, as compared with 752,122 at the corresponding date in 1897; being an increase of 43,119. No fewer than 11,457 of these were in the district of the New River Company; the Kent, Lambeth, and East London Companies increasing their number by 9292, 6358, and 5388 respectively. The total income of the Companies was £2,275,951, or at the rate of £2·63 per house supplied; maintenance and management cost £987,595, or £1·14 per house; and the net profit was £1,036,178, or at the rate of 10·06 per cent. on the stock and share capital. With regard to the Municipal Corporations, the analyses of the accounts show that in Edinburgh the supply of water produced a clear surplus of £2060; in Glasgow, the ordinary service yielded a surplus of £4131, while the river supply resulted in a deficiency of £1366; and in Manchester, the surplus was £28,630. The average daily supply per head in the three cities, in the period covered by the accounts, was: Edinburgh, 39 gallons; Glasgow, 55 gallons; Manchester, 28 gallons. For a mass of other statistics we must refer the reader to the interesting compilation under notice.

WATER ACTS FOR 1899.

(*Continued from p.* 935.)

The Godalming Corporation Water Act sanctions the purchase by the Corporation of the undertaking of the Frith Hill, Godalming, and Farncombe Water Company, Limited. The paid-up share capital of the Company is £35,000, besides which they had borrowed about £10,000 from their bankers, and owed £5500 on mortgage debentures. The Corporation agreed to give the Company £51,000, to clear off the overdraft, and to pay winding-up expenses. The mortgage debentures were to remain a first charge upon the undertaking. Displaced officers are to be compensated. Local Authorities interested may purchase outlying portions of the undertaking. The rates for domestic supplies are 7½ to 7 per cent. The maximum price for water supplied by meter is 2s. per 1000 gallons. Water must not be sold in bulk outside the county of Surrey. A new water-works loan of £20,000 is authorized. All water capital is repayable in fifty years.

The Scunthorpe Urban District Gas and Water Act empowers the Urban District Council to make water-works, comprising a well and pumping-station and water tower, on their own land in the parish of Scunthorpe. Rates for domestic supplies are 8 or 7 per cent., with 8 per cent. for inns. The maximum price of water supplied by meter is 2s. per 1000 gallons. A water-works loan of £25,000 is authorized, repayable in fifty years.

The Stockport Corporation Water Act authorizes the Corporation to purchase the undertaking of the Stockport District Water-Works Company. Powers of purchase were conferred upon the Corporation by an Act of 1867; but these have remained unexercised, and in lieu thereof terms of purchase have been agreed upon and are scheduled in the present Act. The consideration for the transfer is chiefly "Stockport Corporation redeemable water annuities." The interest of the officers is protected. The water-rates are to be uniform outside and inside the borough. Lands required for the prevention of pollution, to the extent of 300 acres, may be acquired and held by the Corporation. Certain neighbouring District Councils are protected. The water supply is to be effectually filtered within three years. The District Council of New Mills are authorized to purchase their part of the undertaking within six months. The Councils of Wilmslow and Alderley Edge are empowered to receive softened and clarified water within two years. Part of the supply is taken from the Corporation of Manchester, under the terms of scheduled agreements. The sum of £45,000 is to be borrowed for improvement purposes, to be repaid in 55 years. Surplus water profits are to be applied in reduction of the rates for domestic supply.

The Belfast Water Act extends the Commissioners' district of supply. Additional water-works are sanctioned, chiefly for the purpose of filtration. Lands are to be acquired for facilitating the construction of works, and preventing pollution. The Commissioners may stock such lands with sheep and other live stock. The additional lands are to be acquired within five years. The sum of £250,000 is to be borrowed for water-works purposes, repayable in sixty years. A clause requires a distance of 2 feet to be kept between gas and water mains. The Commissioners are empowered to let the Antrim Road works for recreative purposes, including boating. The Commissioners may subscribe one-fourth of the amount of any superannuation fund formed by their servants.

The Burley-in-Wharfedale Urban District Water Act sanctions the construction of additional water-works, including an impounding reservoir on the Carr Beck, on Burley Common. Lands are also required. The Menstone Water-Works Company are protected. Compensation water is be discharged down the stream named at the rate of 18,600 gallons per day. Precautions are to be taken for the prevention of plumbism, under the supervision of the West Riding County Council. The sum of £12,000 is to be borrowed for water-works purposes, repayable in 55 years. Water may be supplied in bulk, but not in Menstone, except with the consent of the Company.

The Bury Corporation Water Act authorizes the Corporation to construct a new reservoir on the Ogden Brook, in the parish of Haslingden, with subsidiary works, to be completed within ten years. Lands forming drainage areas necessary to their system may be held by the Corporation. The supply must be filtered. Certain sources are barred from domestic utilization. The interests of consumers in the borough of Haslingden are protected; and the supply to the borough is to be improved under a penalty of £40 per week. Local Authorities are empowered to take water for fire practice at 6d. per 1000 gallons. The rates for domestic supplies are raised on an average 2 per cent. Money may be borrowed to pay off the water annuities. For the construction of the authorized water-works, the sum of £243,000 is to be borrowed, and £160,000 for the purchase of protection lands—repayable in sixty years. An agreement is scheduled and confirmed, by which the Bury Corporation bind themselves to promote next session a Bill for constituting a Bury and District Joint Water Board.

The Glasgow Corporation (Gas and Water) Act increases the water capital of the Corporation by £250,000.

The Glastonbury Water Act authorizes the construction of additional water-works, comprising a well in the parish of Pilton. The limits of supply are enlarged. The district of Street is to be supplied in bulk. The owner of the land where the new well is to be made is to be supplied gratuitously with water for farm purposes. Compensation water to the amount of 300,000 gallons per day is to be discharged into the River Redlake. The rates for domestic supplies range from 9 to 7 per cent. The sum of £15,000 is to be borrowed for water-works purposes.

The Nuneaton and Chilvers Coton Urban District Council Water-Works Act authorizes the Council to construct additional water-works comprising two wells and pumping-stations in the parish of Nuneaton, with subsidiary works, to be completed within seven years. Certain water-works authorized by the Council's Act of 1897 are to be abandoned. The Water-Works Clauses Act, 1847, is amended by leaving out from section 44 the words "with the consent in writing of the owner or reputed owner of any such house or of the agent of such owner."

The Perth Water, Police, and Gas Act sanctions the construction of a new impounding reservoir at Upper Muirhall, in the parish of Kinnoull. The waters of the River Tay may be taken for the purposes of the undertaking. The additional sum of £15,000 may be borrowed for water-works purposes. The surplus profits are to be devoted to the reduction of the domestic water-rate.

The Rhondda Urban District Council Act authorizes the construction of three additional wells and four pumping-stations, all in the parish of Ystradyfodwg, to be completed within seven

years. Clauses are inserted for the protection of the Bute estate, the Earl of Dunraven, and others. The time stated in the Act of 1896 for the completion of certain works is extended by three years. All surplus water profits are to go to the district fund.

The Tees Valley Water-Works Act authorizes the Stockton and Middlesbrough Water Board to construct a new reservoir in the parish of Long Newton, to be completed within six years. For the purposes of the Act, the Corporation of Stockton are empowered to borrow £153,460, the Corporation of Middlesbrough £184,152, and the Corporation of Thornaby-on-Tees £30,692. The loan is repayable in sixty years. The area of supply is extended to include parts of the parish of Croft, in Yorkshire. The regulation of the fish-passes of the Grassholm reservoir is altered. The charge for water supplied to large consumers is increased from 3d. to 3½d. per 1000 gallons. The name of the Board is changed to the Tees Valley Water Board.

The Wishaw Water Act enables the Commissioners of the Burgh of Wishaw to borrow a further sum of £25,000 for the purpose of constructing the compensation water reservoir sanctioned by their Act of 1898.

OBITUARY.

We regret to record the death, on Monday last week, at his residence in South Kensington, of Major-General A. de Courcy Scott, R.E., the Official Water Examiner under the Metropolis Water Act, 1871. Deceased received this appointment early in 1887, on the death of Sir Francis Bolton, who had filled the position of Water Examiner from the date of the passing of the Act. When the vacancy occurred, it was thought that the post would be offered to Dr. (afterwards Sir Edward) Frankland; but in giving it to an ex-officer of Engineers the Local Government Board probably wished to ensure a continuity of the practice instituted by his predecessor. General Scott was conversant with the London Water Question, having published a pamphlet entitled "London Water: A Review of the Present Condition and Suggested Improvements of the Metropolitan Water Supply;" and, further, he was an examiner in the Science and Art Department at South Kensington. He was one of the members of the present Royal Commission; and it is a singular circumstance that he is the second of that body who has been removed by death before the result of their investigations is made known—Mr. H. W. Cripps having died a short time ago. Moreover, the Local Government Board have lost, by the death of Sir Edward Frankland and General Scott, the two officials on whom they relied for advice on water questions. It only remains to say that deceased entered the Royal Engineers in 1853 as a second lieutenant, and was present at the siege of Sebastopol; receiving the medal with clasp and also the Turkish medal. He retired in 1884 with the rank of Major-General.

PERSONAL.

The Batley Town Council last Thursday passed a resolution increasing the salary of their Gas Engineer and Manager, Mr. J. F. Bromley, by £50 per annum. Testimony was borne to Mr. Bromley's capabilities; and it was mentioned that, during his management, the gas undertaking, from being a loss, had been transformed into a concern yielding a handsome profit, while at the same time the price of gas had been reduced from 3s. 3d. to 2s. 3d. per 1000 cubic feet.

Mr. J. W. Buckley, Engineer and Manager of the Falmouth Gas Company, is a candidate for election as representative of the Arwenack Ward on the Town Council next month, and he is receiving influential and general support. He approves of the proposal to purchase the water-works, on condition that the management is placed in the hands of a thoroughly trained engineer. If elected, he will give special attention to improving the drainage of the town, which is now in a disgraceful state, as evidenced by the recent epidemic of typhoid fever, by which Mr. Buckley sustained a severe bereavement.

In the "Journal" last week we announced the appointment of Mr. W. S. Morland to the engineership of the Gloucester Gas Company, in succession to his father. We learn that Mr. James Paterson, son of Mr. R. O. Paterson, of Cheltenham, has been selected to fill the position of Assistant-Engineer. Mr. Paterson received a portion of his education at the Cheltenham Grammar School, and afterwards proceeded to the Jena University, where he spent seven months in the famous chemical laboratories. He took his B.A. degree, with honours, at Cambridge (second-class Natural Science Tripos, Part I.), in 1897. He was a pupil for one year under his father, and subsequently for a similar period under his uncle, Mr. T. O. Paterson, at Birkenhead.

Professor W. Ivison Macadam, of Edinburgh, is a friend to the gas industry, as is evidenced by his frequent appearances at meetings of gas managers. He does not, however confine himself to this aid, but carries the torch of enlightenment upon gas matters into the midst of scientific societies generally, which is of as much assistance as is inside help. That his services in this way are appreciated—not to say rewarded—is a matter which, we are sure, will give gratification to gas managers everywhere. Last week he received two honours. The Royal Scottish Society of Arts awarded him their complimentary silver medal for a paper on "Incandescent Lighting with Gas," read before them in January last; and the Edinburgh Association of Science and Arts specially thanked him for a paper on "Carburetted Water Gas" contributed to them last session.

Difficulty has arisen at Oldham in connection with the appointment to the borough accountancy of Mr. Arthur Andrew, the Superintendent of the Corporation Gas and Water Departments. The Finance Committee appear to have been entirely responsible for the election. Mr. Andrew was invited to take the position—he did not seek it, although he feels capable of combining the two offices, and discharging the duties appertaining to them. When the resolution of the Finance Committee came before the Town Council, it was referred back; the reason being that there is a strong feeling on the Gas and Water Committees that it would be a prejudicial thing to take Mr. Andrew away from the work of these departments, and that it would be better to appoint another officer to the borough accountancy. Mr. Andrew, not being answerable for the creation of the difficulty, thought the Corporation should settle it; and, as a step towards that end, the Mayor, at the last meeting of the Finance Committee, moved that Mr. Andrew be appointed Borough Accountant, on condition that he resigned the position of Superintendent of the Gas and Water Departments. This he has since done in a letter addressed to the Chairmen and members of the Gas and Water Committees. In the course of the communication, he says: "My only reason for making the change is that, by doing so, I shall better my position from a financial point of view. I cannot sever my 35 years' connection with the Gas and Water Departments without a keen feeling of regret; and I also take this opportunity of expressing my sincere thanks for the unvarying kindness I have always experienced whilst in your service." The letter was read at a joint meeting of the Committees on Wednesday, when it was decided to confer with the Finance Committee on the subject, and, if necessary, to arrange for a joint meeting of the three Committees. Mr. Andrew has been Chief Superintendent of the Gas and Water Departments for the past five years.

NOTES.

The Westinghouse Gas-Engine—Exhaust Silencing.

A good deal has been heard of late of the Westinghouse gas-engine, of which those who are in the business, at any rate, expect great things. According to an address delivered by Mr. Henry E. Longwell to an American Engineers' Society, the actual state of the gas-engine, as a prime mover existing in a variety of forms, is a result of progressive development rather than of individual invention. The contribution of the Westinghouse Machine Company to this development is described as the perfecting of a method of governing by varying the quantity of gas and air admitted to the cylinder, without changing their relative proportions. [It is only fair to state that the validity of this method of adjusting the power generated to the work required of the engine, is denied by other specialists in this branch of mechanical engineering.] To this principle in governing, however, the Westinghouse people seem to stand committed. They are relying upon it for the largest gas-engine yet designed—a three-cylinder motor to develop 1500-horse power. Each cylinder will be 34 inches in diameter, and of 60-inch stroke. The fly-wheel is to be 19 feet in diameter, and to make 100 revolutions per minute. The engine will stand 27 feet high; and it will be used to generate electricity by a directly-coupled dynamo. The combined machines will be 44 feet long. Mr. Longwell stated that, with Pittsburg natural gas having a thermal value of about 1000 heat-units per cubic foot, the consumption of a Westinghouse engine at full load is about 10 cubic feet per brake horse power per hour. In the discussion which followed the address, Mr. W. J. Baldwin described a silencing device for gas-engine exhausts. This is simply to carry the pipe up above the roof of the building, and finish it with a length having two long, narrow slits opposite one another. The top of the pipe is then capped, and the statement is that noise is effectually muffled.

The Consumption of Steam for Power.

Valuable information respecting the economical data of modern steam-engine performance is given by Mr. Bryan Donkin in a table supplement of the "Engineer" dated Oct. 13. A common rule is to take an indicated horse power as requiring 20 lbs. of steam per hour. There should be no difficulty in conforming to this standard, since the best result cited by Mr. Donkin is 10·44 lbs. of steam per indicated horse power per hour, including jacket water. This was for a quadruple expansion steam-engine indicating a total of 1446-horse power, working at 213 lbs. steam pressure, driving a dynamo. Low as the steam consumption is in this example, it is closely approached by others of the triple, reciprocating, condensing Sulzer type. In the series of water pumping-engines—reciprocating, condensing, compound, and triple—the best performance is 11·52 lbs. of steam per indicated horse power per hour, in the case of a 207-horse power engine working with dry steam at 145 lbs. pressure. This also was a Sulzer engine. The next of the same class was an Allis engine, three-cylinder, vertical, indicating 376-horse power. The steam consumption was 12·13 lbs. per indicated horse

power per hour. A steam consumption of from 15 to 17 lbs. seems to be ordinary working with a Simpson or the Chester Hydraulic Company's pumping-engines. In the series of mill engines and electric lighting plant motors, the best performance was 12·1 lbs. superheated (13·2 lbs. saturated) for an engine indicating 1092-horse power. From these data, the normal requirements in the matter of steam of first-class, large condensing engines can be reckoned. The smallest engine catalogued by Mr. Donkin is 152¾-horse power, and the largest 1875-horse power. Most of the examples are foreign; but several good specimens of English work are included. The small margin of difference between the best results of various sizes and types of steam-engines is remarkable.

Portable Oil-Engines.

It is generally understood that the Agricultural Societies of the United Kingdom had much to do with the improvement of the portable steam-engine, which has proved so useful a tool for a large variety of engineering purposes during the last thirty years. It would be difficult to name the engineering work of any magnitude in which the portable steam-engine has not figured. Of late years, persistent attempts have been made to adapt the oil-engine, which is really a gas-engine, to the purposes previously monopolized by the portable steam-engine. At the Edinburgh show this year of the Highland and Agricultural Society of Scotland, there was an oil-engine competition, to which ten makers of this class of motor contributed. The judges' report on the trials of these engines has just been published. It usefully marks the actual achievement of mechanical engineering in this department. Generally speaking, the oil-engine is a cheaper source of power on a farm, or engineering works, than a steam-engine. It only uses its fuel while actually at work, and can be started at full power at a moment's notice. No prizes were awarded at Edinburgh; the tests being intended to ascertain what every engine could do at full declared brake load, at half-load, and finally at the maximum possible power, or emergency load. All the engines worked satisfactorily with any kind of burning petroleum oil procurable from the usual trade sources. Without exception, the makers declared their willingness to use any description of kerosene of about ·8 sp. gr. Broadly speaking, with oil priced at 6½d. per gallon on the spot, the cost of a brake horse power with these motors, at full load, varied according to size and other things, from 0·59d. to 1·33d. per hour. At half-power, it was from 50 to 100 per cent. more. All the engines pleased the judges exceedingly. The combustion of the oil appeared to be practically complete; the exhaust being very clean even when running light. There was no case of bearing-heating; and on opening up the engines subsequently for inspection by the Committee, all were found practically free from fouling of any description.

The Maintenance of the Families of Reservists.—The calling up of the Reserves which has resulted from the complications in South Africa has drawn from the ranks of the employees in gas and water works, as well as in probably every industrial undertaking, a number of men whose families will thereby be deprived of their customary means of support; and a correspondent asks us to give publicity to a suggestion that a fund should be started for their maintenance during the absence of the bread-winner in the service of his country—such fund to be kept up by small weekly contributions by the remaining workmen. He thinks the suggestion might be submitted to the men by the managers or foremen; and he believes it would be favourably entertained. In complying with our correspondent's request, we may point out that many large employers of labour have not only undertaken to keep open the places of the men called away, but to grant maintenance allowances to their families. For instance, the East London Water Company have decided to allow half-pay to the wives of the Reservists in their employ who have been called to the Colours.

The Examinations in "Gas Manufacture."—The report on the work of the Examinations Department of the City and Guilds of London Institute for the Advancement of Technical Education for the session 1898 9 has just been issued. It shows that during the session there was the same growth and development in the work of the Department as in former years. The total number of students was 36,155, as compared with 34,990 the previous session; the number of candidates examined being 14,978, against 14,148. In "Gas Manufacture," 168 candidates presented themselves for examination, of whom 81 passed and 87 failed, or 51·7 per cent. of the total. Last year the number was 171, of whom 97 passed and 74 failed; the percentage of failures being 43·2. From the table furnishing details of the passes and failures we find that in the Honours Grade two candidates passed in the first class, 20 in the second class, and 43 failed; while in the Ordinary Grade 20 passed in the first class, 39 in the second class, and 44 failed. A list of the successful candidates was given in the "JOURNAL" for July 18 (p. 183). Last year the results were as follows: Honours Grade—First class, 7; second class, 8; failed, 33. Ordinary Grade—First class, 26; second class, 56; failed, 41. Reporting upon the past session's work, the Examiner (Mr. Alfred Colson, M.Inst.C.E.) says that, speaking generally, the candidates' papers were not equal to previous years. In both grades it was evident that the students were "greatly lacking in knowledge of construction as well as of draughtsmanship."

TECHNICAL RECORD.

THE PAPERS READ AT THE ACETYLENE CONGRESS.

(*Concluded from p.* 940.)

M. Guilbert, of Paris, next gave a paper on "The Calcium Carbide Works of France." They were, he said, for the most part only of small or moderate size, and intended for other manufactures besides that of carbide. Many works combined the business of electric lighting with carbide production. The industry was developing rapidly, and some works were doubling their output; while new works were also being started. The French Alps, the Savoy, and the Dauphiné included the majority of the works—especially those of moderate capacity. Fused carbide was produced, as the yield was found to be greater than when block carbide was made. At the works of M. Bertolus, at Bellegarde, on the Rhone, where furnaces of original design with three electrodes were used, a yield of 5¼ lbs. of carbide per 24 horse-power-hours was secured. The lime used was from 98 to 99 per cent. calcium carbonate, with small amounts—0·25 to 0·45 per cent.—of magnesium. Almost all the works stated that the lime used was free from phosphorus. The carbon employed was English anthracite or coke, having from 4 to 10 per cent. of ash. The carbide was guaranteed to yield on the average 4·8 cubic feet of acetylene per pound. The gas, owing to the good quality of the raw materials, had a high degree of purity, and only rarely proved to contain phosphuretted hydrogen and sulphuretted hydrogen. Even the smallest French works produced their own packing tins, which were of the simplest type, with soldered tops. The price obtained for the carbide had latterly been only about £14 per ton, exclusive of packing, which cost about £2 per ton. The French carbide was disposed of in France, Germany, Italy, South America, England, Spain, Algiers, and India. The author gave some details of about twenty of the French works, in so far as the secrecy observed at them permitted.

Dr. A. Ludwig, of Charlottenburg, delivered a lecture on "Advances in the Construction of Acetylene Generators." Of the three systems of generators in vogue, he said that those in which carbide was projected into water were perhaps the best known, though their construction was attended by considerable practical difficulty. Actually, for small private installations, it had been found best to adopt hand charging in place of automatic devices. The chief trouble which had not been overcome with this system of generators was caused by the dust in the carbide, which, on the introduction of the latter into the generator, might conceivably lead to the spontaneous ignition of phosphuretted hydrogen at the moment when the decomposition of the dusty carbide occurred. An objectionable feature, also, of this system of generators was the foam which arose when certain kinds of carbide were used. The foam probably was caused by the presence of aluminium carbide (which yielded methane) in the carbide. Care had to be taken that the lime sludge was sufficiently diluted, in order that the carbide might readily sink in it. A reasonable allowance of water was four to five times the amount of carbide—for instance, about 3 pints of water per pound of carbide. The smaller each portion of carbide, and the longer the intervals between the discharge of the portions into the water, the greater must be the excess of water employed. Under the conditions indicated above, about 2 per cent. of the acetylene would be lost owing to its absorption in the water in the generator. It was therefore advisable to use the water again after the lime had deposited from it. The system of generators in which water overflowed detached portions of carbide had undergone great improvements; and this method was extensively used in table and vehicle lamps. The dip system of generators had been in ill-repute for a long time; but latterly improvements had been made, and it was being re-introduced. It remained to be seen whether the working would be better than formerly. It was not unlikely that good practical results might bring the system into use, despite adverse laboratory experiments. Purifiers had now been very generally introduced.

M. Daix, of Paris, gave a paper on "The Temperatures and After-Development in Acetylene Generators." Injuriously high temperatures occurred in both the dip and the drip systems of generators; and consequently they had both been regarded as very dangerous. But too much importance had been attached to the results of laboratory researches, made in the early days of the acetylene industry, on apparatus such as no practical acetylene engineer would now turn out. Therefore these results were not applicable to modern plant. Dip and drip generators existed which had been working for long periods without ill results. Now they were constructed with a view to avoiding the concurrent evils of high temperature and after-development; whereas in the early generators of these types, the inventors had been beguiled by the simplicity of their construction, and had been heedless of the disadvantages which laboratory researches soon made conspicuous. Modern generators of these types, constructed by technical men, differed greatly from the early ones, and would afford much better results. In practice, the generators of to-day did not present working conditions favourable to the production of high temperatures and to after-development of gas. A prevalent idea was that high temperatures and after

development were only to be avoided by bringing small quantities of carbide into a large excess of water; but if this view were accepted as correct, makers of generators would be confined to one or two types, which were not suitable for all purposes. Therefore attention ought to be directed especially to the dip and drip systems of generators, in order to reduce as far as possible—or even to avoid entirely—the dangers supposed to be inseparable from their use. The great simplicity of these types of construction should incite inventors to perfect such generators.

Professor V. B. Lewes stated that the presence of products of polymerization and decomposition in the gas was the only reliable guide to what had happened in the generators. The temperature of fusion of thin wires and plates which had not fused in the generator, did not represent the maximum temperature therein. When water was allowed to drip on to carbide, without special precautions, the lime sludge had been found to be discoloured by the presence of tar; and when the gas formed had been scrubbed, it had yielded benzene and higher products of polymerization. It was well known that tar could not have been formed if the temperature had not been much in excess of 500° C. (932° Fahr.); and only one inference as to the temperature prevailing in the generator could therefore be drawn from such facts.

Herr I. Pfeiffer, of Buda-Pesth, gave a report on the work done with acetylene installations on the Hungarian State Railway. These installations had been commenced when the acetylene industry was in its infancy; and many difficulties had been encountered in both generators and burners. The purification of the gas had, however, proved the most troublesome question. The purifying material now employed consisted of chloride of lime and alkaline solution of lead containing an excess of caustic soda. It was used in grid purifiers, and worked well. In general, acetylene lighting was now satisfactory, though there was still room for improvement in many respects.

M. Berthelot, of Paris, had forwarded a communication in which he had collected the results of researches made in conjunction with M. Vieille on the explosibility of acetylene. The explosive qualities of acetylene depended, he said, on the considerable temperature of combustion, arising from its endothermic nature. The high temperature, however, accounted for its great illuminating value. The explosive properties of illuminating gas were partly those which were common to all mixtures of gas and air, and partly those which were only found in endothermic gases, such as acetylene. Of all the gases used for illuminating purposes, acetylene was the only one which was explosive *per se* and without admixture of air. The explosion of acetylene, initiated by a spark or similar means, was, however, purely local, and did not propagate itself—unless, indeed, the gas were under a pressure of more than 2 atmospheres, when frightful explosions ensued. Acetylene was not exploded by shock, even when under a pressure exceeding 10 atmospheres. Explosion ensued when acetylene had been very hastily compressed, so that great internal heating had suddenly arisen in the process. An attempt had been made to reduce the risk of explosion by dissolving the acetylene in acetone. One pound of acetone dissolved 0·32 to 0·40 cubic foot of acetylene; and if the pressure under which the solution stood remained below 10 atmospheres, explosion did take not place either from ignition or shock. But when explosion ensued, decomposition of the acetone occurred, with partial absorption of the heat liberated by the acetylene. With mixtures of acetylene and hydrogen, and acetylene and coal gas, the propagation of the explosion changed according to the pressures. The limits of propagation would appear to be: For equal volumes of acetylene and hydrogen 4 atmospheres, for a mixture of one volume of acetylene and three volumes of hydrogen 10 atmospheres, for a mixture of equal volumes of acetylene and coal gas 7 atmospheres, and for a mixture of one volume of acetylene and three volumes of coal gas 40 atmospheres.

M. Gin, of Paris, gave an address on "Carbide Manufacture," in which he dealt with the energy needed. Considerable errors in calculating the yield of carbide arose, he said, from imperfect knowledge of the energy required. Both theoretical calculations and practical results varied very considerably. For the heating of 56 grammes (1 molecular proportion) of lime to 3300° C. (the temperature of the electric furnace) 43,060 calories were needed; and for the heating of 36 grammes (3 molecular proportions) of carbon to the same temperature, 53,940 calories were required—making a total of 97,000 calories. The decomposition of the lime needed, in addition, 145,000 calories—making a total of 242,000 calories, of which only 30,000 calories were to be deducted as the heat of formation of the carbonic oxide and calcium carbide. Hence 212,000 calories, or 245·5 Watt-hours, were needed for the formation of 1 molecular proportion (64 grammes) of calcium carbide; and consequently almost exactly 3900 kilowatt-hours were required for the formation of a ton of carbide. On account of the loss in conductors, generating plant, furnaces, &c., a considerable addition had to be made to this figure; and it would not be too high an estimate to place the energy needed at over 7000 horse-power-hours, or the equivalent of 5235 kilowatt-hours, which was about 1335 kilowatt-hours more than the calculated amount. For every kilowatt, there should be obtained 10¼ lbs. of carbide. Water power as a source of energy had considerable economical advantages as compared with steam power. The latter might perhaps find profitable application for carbide manufacture under peculiarly favourable conditions; but it could never enter into direct competition with water power.

Dr. A. Ludwig, of Charlottenburg, gave an account of the production of lamp-black from acetylene. Acetylene, he said, yielded lamp-black of extreme delicacy, good colour, and a high degree of purity. It mixed well with water, oil, size, and varnishes. Printing ink made from it was of a very deep black, and very lustrous. Theoretically, acetylene should yield 92·3 per cent. of lamp-black; and practically this yield was very nearly obtainable. The lamp-black contained 99·2 per cent. of carbon.

M. Lacroix, of Paris, in his lecture on the temperatures attained in drip and dip generators, adopted the same position with regard to these types that M. Daix had already taken in his paper. He contended that danger was not so much inherent to the system as to the particular construction.

Herr F. Liebetanz, of Düsseldorf, concluded with a paper on the "Application of Calcium Carbide and Acetylene for Purposes other than Lighting." He referred to the production of alcohol and lamp-black, and pointed out that a temperature of 1500° C. (2732° Fahr.) was attainable in acetylene furnaces, which were made suitable either for laboratory or industrial use. Acetylene blast furnaces gave so high a temperature that the furnace-lining was fused; and inventors had proposed to utilize the high temperature thus attainable for the production of carbide. Calcium carbide found application as a reducing agent in metallurgical processes. An experimental factory was being erected for the production of potassium cyanide from calcium carbide. Among the other applications of carbide, might be mentioned its use for medicinal purposes, as an explosive, for the destruction of phylloxera and mildew, for life-belts, for raising sunken vessels, and for manufacturing many chemicals. Acetylene motors were already freely used, and consumed from 5·30 to 6·35 cubic feet per horse-power-hour.

M. Pichon, of Paris, made a brief communication on the causes of accidents in the use of acetylene, in which he laid special stress on the evils resulting from impure carbide, and the dangers of a mixture of gas and air being present in generators.

This brought the congress to a close.

THE USE OF COKE IN THE TREATMENT OF SEWAGE.

It may be remembered that the above subject was dealt with by Professor Frank Clowes, D.Sc., F.I.C., the Chief Chemist and Superintending Gas Examiner to the London County Council, at the recent meeting of the British Association at Dover (see *ante*, p. 878). Dr. Clowes has since, in conjunction with Dr. A. C. Houston, M.B., presented to the Main Drainage Committee of the Council a voluminous report (the second on the subject) on the bacterial treatment of sewage, giving an account of the experiments carried out with the crude sewage of London in the coke-beds at Crossness. The report is in two divisions—the first (chemical) by Dr. Clowes, and the second (bacteriological) by Dr. Houston.

In his introductory remarks, Dr. Clowes states that, after duly considering the different methods of dealing with sewage which have been proposed, it appeared to him that the intermittent treatment in bacteria coke-beds was the one most likely to be suitable to the conditions at the Council's northern and southern outfalls. This treatment depends upon the action of bacteria; and therefore the term "filtration," which implies mechanical removal of suspended impurity, should, he says, be abandoned. On Feb. 15, 1898, the Council approved, on the recommendation of the Main Drainage Committee, of his proposal that further experiments should be made on this process of intermittent bacterial treatment in coke-beds; and the Chief Engineer (Sir A. Binnie) willingly accorded his co-operation. Dr. Houston was retained for the purpose of conducting bacteriological investigations during the first year of the experimental work; and a grant was voted by the Council for the purpose of laying down coke-beds on a small scale at Crossness, and for maintaining their working. These were constructed and worked to his entire satisfaction. It appeared to Dr. Clowes to be necessary that the crude sewage at the northern outfall should be subjected to similar experimental treatment; and a further sum was accordingly voted by the Main Drainage Committee on July 21, 1898, to equip small experimental coke-beds. Full particulars respecting them and the results obtained by them are to be included in a special report in due course. The Committee received in June last year a report on the results obtained by Dr. Houston from a bacteriological examination of the crude sewage as it arrives at Crossness and at Barking; and in the report now presented the results are stated which were obtained by him from a similar examination of the sewage after its passage through the coke-beds. Dr. Clowes explains that his experiments were carried out by filling the coke-beds with sewage until the coke was just submerged, then allowing the sewage to remain in contact with the coke for several hours, and finally draining the liquid away completely. The coke was then left for some time in contact with the air, which fills the interstices of the coke-bed when the liquid has flowed away. This series of processes is repeated at regular intervals.

Passing on to deal next with the objects of the experiments,

Dr. Clowes points out that the bacterial treatment of sewage in coke-beds is already in use for purifying the sewage of several towns containing a population less numerous than that of London. But in order to render the process adaptable to the treatment of London sewage, it appeared to be necessary to use coke-beds which were deeper, and which could be more rapidly filled and emptied, than those usually employed elsewhere. Since London sewage is of a special character, consisting not only of domestic drainage but of manufacturing refuse of the most varied description, it seemed advisable to ascertain by a lengthened experience whether its purification was possible, and whether it could be regularly maintained by the process of bacterial treatment. With these objects in view, coke of fairly large size was employed, and the coke was introduced into tanks of considerable depth, so as to enable the layer to be progressively increased in thickness during the progress of the experiments. The main objects of the experiments were to ascertain—(*a*) the effect of using the coke in fragments about the size of a walnut; (*b*) the effect of increasing the depth of the layer of coke beyond the usual limit; (*c*) the extent to which the raw sewage underwent purification by the treatment; (*d*) the practicability of maintaining the constant passage of raw sewage through the same coke-bed, without deterioration occurring either in the bed or in the effluent; (*e*) the amount of sewage which could be treated daily by a superficial unit of the coke-bed; (*f*) the extent to which the effluent underwent further improvement by its passage through a second similar coke-bed; (*g*) the suitability of the effluent for maintaining the life of fish; and (*h*) the effect of the treatment on the number and nature of the bacteria which were present in the raw sewage. The general results obtained from about ten months' experience of the coke bed treatment point to the following conclusions:—

Size of Coke.—The use of ordinary gas coke, in pieces about the size of walnuts, seems to be attended with the following advantages, as compared with the use of smaller coke. The larger coke enables the bed to hold a greater volume of sewage. The beds now in use had an original capacity for sewage which was nearly equal to the volume of the coke which they contained, in place of only 20 or 30 per cent. of that volume, as is shown by beds containing smaller coke. The use of the larger coke also allows the beds to be more rapidly filled and emptied, and to be more completely emptied and aërated.

Depth of Coke.—Coke-beds similar in character, but differing in depth, have been found to give practically identical purifying effects. At present experience has been obtained only with a 4-feet and with a 6-feet bed; but arrangements are being made to extend these depths considerably. [On June 21, 1899, a bed 13 feet in depth had been working satisfactorily for over nine weeks, and had given a purification approximately equal to that effected by the 4 feet bed.]

Chemical Purification Effected by a Single Treatment.—The sewage had been roughly screened before reaching the coke-beds, and it was free from larger matter usually described as "filth," and from coarse sand and heavy mineral road detritus; but it contained all the suspended solid matter usually termed "sludge." During part of the period reported upon, the coke-beds received only one charge of this raw sewage daily; but latterly all the coke-beds have received two charges daily of raw Crossness sewage. The coke-beds have removed the whole of the suspended matter or "sludge" from the crude sewage; and they have yielded an effluent which occasionally shows a slight turbidity, apparently due, in ordinary flow, mainly to the presence of bacteria, but which is increased in storm flow by fine clay and mud. Not only has the suspended matter been removed, but the removal of the dissolved oxidizable and putrescible matters of the raw sewage has been secured to the average extent of 51·3 per cent. by the single process, the 4-feet coke-bed giving 52·7 per cent., and the primary 6-feet bed 49·9 per cent. The effluent thus produced remains free from objectionable odour when it is kept in open or closed vessels, provided the bacteria present in it are not removed or killed by special subsequent treatment. The effluent could not, therefore, produce any offensive smell when it is introduced into the river.

Permanency of Coke-Beds.—Since the coke-beds have become regular in their action, neither the effluent nor the coke itself has fouled. The coke which has been in use for upwards of twelve months has shown no general tendency to break up; but the surface of each piece has become partially covered with soft matter which consists mainly of fine particles of coke with some fine sand, woody and vegetable tissue, cotton and woollen fibres, and diatoms. Below this thin film the coke is perfectly hard, and no sand has penetrated 2 millimetres below the surface. The sand when examined by polarized light was found not to be granite sand derived from road detritus. The ash in the coke has been reduced in amount by about 25 per cent. during its exposure to sewage in the bed. The capacity of the 4-feet bed has, during the period under review, been reduced from 50 to 33 per cent. of the whole volume of the bed. This reduction of capacity appears to be mainly due to fragments of straw and chaff, apparently derived from horse-dung, and to woody fibre derived from the wear of wood pavements. The treatment of raw sewage by this coke-bed is being continued, in order to ascertain whether the decrease in the capacity goes on. It has been ascertained that the original capacity is not restored in any degree by prolonged aëration, which proves that the deposit on the surface of the coke was not organic matter of animal origin; but it has been found that the vegetable tissue, which appears to be the main cause of the decrease in capacity, can be in great measure separated from the raw sewage by a brief period of sedimentation before the sewage is allowed to flow into the coke-bed.

Amount of Sewage which can be Treated Daily by a Superficial Unit of the Coke-Bed.—The volume of sewage which can be passed through the coke-bed per unit of superficial area has not yet attained its maximum, since the depth of the bed is being further increased. It originally amounted to 555,000 gallons per acre per day for the 4-feet bed, and to 832,500 gallons per acre per day for the 6-feet bed. This represents in each case one filling per day. But, as already stated, two fillings have been made successfully for six months; and this corresponds to 1,665,000 gallons per acre per day for the 6-feet bed. These amounts are reduced, after ten months' working of the beds, to 370,000 gallons per acre for a single filling of the 4-feet, and to 673,400 for the 6-feet bed. The maximum possible rate of treatment by each bed is possibly not yet reached.

Secondary Treatment.—It has been stated that the purification effected by a single treatment of the raw sewage in the coke-beds amounts to a complete removal of the suspended matters, and to a further removal of an average of at least 51·3 per cent. of the dissolved putrescible oxidizable matter. The primary 6-feet bed actually removed, on an average, 49·9 per cent. of dissolved impurity, and a second process has effected thus far an additional purification of about 19·3 per cent.; giving a total average purification of the clarified raw sewage amounting to about 69·2 per cent.

Effect of the Effluent on Fish.—Fish die at once when they are placed in the present effluent produced by chemical precipitation, probably because there is a serious deficiency of dissolved oxygen in the impure liquid, and therefore their respiration cannot be maintained. Not only gold-fish, but roach, dace, and perch have lived for months in the first effluent from the coke-beds; and they apparently would live and thrive in this liquid for an indefinite period.

Bacteriological Character of the Effluent.—The results obtained by the bacteriological examination of the effluent by Dr. Houston seem to indicate that the coke treatment does not by any means remove the bacteria from the crude sewage, and, indeed, does not materially reduce the number. It shows that the presence of many of them in the effluent is possibly unobjectionable, and is probably necessary for the purpose of completing the purification of the effluent when it has flowed into the river; but it further shows that some of the bacteria, whose presence might be looked upon as undesirable in drinking water, pass through the coke-beds.

Dr. Clowes comes to the conclusion that neither on chemical, nor possibly on bacteriological grounds, can any serious objection be raised to the introduction of the effluent from the coke-beds into a portion of the River Thames which is cut off by locks from the intakes of the Water Companies, and the water from which is not employed for drinking purposes, and cannot be used for drinking on account of its brackish nature. The effluent certainly will not, he says, cause any deposit upon the bed of the river, and will even tend to render the turbid water of the lower river clearer and more transparent. At the same time, the liquid discharged from the outfall into the river will be sweet and entirely free from smell. Further, it will carry into the river the bacteria necessary for completing its own purification in contact with the aërated river water; and therefore under no conditions can it become foul after it has mingled therewith. The effluent will in no way interfere with fish-life in the stream.

As compared with the present process of treating sewage by chemical precipitation and sedimentation, Dr. Clowes says the bacterial process presents the following advantages: (*a*) It requires no chemicals. (*b*) It produces no offensive sludge, but only a deposit of sand or vegetable tissue which is free from odour. (*c*) It removes the whole of the suspended matter, instead of only about 80 per cent. thereof. (*d*) It effects the removal of 51·3 per cent. of the dissolved oxidizable and putrescible matter, as compared with the removal of 17 per cent. only effected by the present chemical treatment. (*e*) Further, the resultant liquid is entirely free from objectionable smell, and does not become foul when it is kept; it further maintains the life of fish.

In the second section of his division of the report, Dr. Clowes explains the construction and method of working of the coke-beds, gives a history of each bed, adduces experimental proof of the aëration of the beds, and describes the condition of the crude sewage and the effluent. This portion of the report is as follows.

Construction and Details of the Coke-Beds.—For the purposes of the present experiments, three brick-lined tanks with brickwork bottoms were specially provided with suitable outlets and with means of charging them with raw sewage by means of a pump and distributing troughs. A series of parallel loose-jointed stoneware drain-pipes were laid on the bottom of the tanks, and were connected with suitable outlets. This arrangement served to draw off the effluent. Two of these tanks (A B) are precisely similar in dimensions, being 22 ft. 6 in. long, 10 ft. 8 in. wide, and 12 feet deep; and the superficial area of each is $\frac{3}{5}$rds of an acre. The third tank (C) is of less regular shape, but of the same area as A and B, and 6 feet in depth. One of the tanks

(A) was filled to a depth of four feet with coke of uniform size; each fragment being about as large as a walnut. The coke was drawn from the retorts of the gas-works at the Crossness outfall, and was found by long soaking in water to absorb 15 per cent. of its weight of water. The coke-bed had a sewage capacity of 3000 gallons, which is equal to 50 per cent. of the volume occupied by the coke and the air space; the volume of the coke amounts to 960 cubic feet. This coke-bed is best described as the "single" bed, since it has been used for the purpose of subjecting the sewage to a single process only.

The other two tanks (C B) have been filled to a depth of 6 feet with precisely similar coke, which was obtained from the South Metropolitan Gas-Works. The sewage capacity of each of these tanks is 4500 gallons. As compared with the single coke-bed, the capacity of the bed is therefore enlarged in proportion to the increased volume of coke which it contains. Tank C is at a higher level than tank B, and the two coke-beds have therefore been easily rendered available for a process of double treatment. The raw sewage has been pumped into tank C, and the effluent from this tank has been allowed to flow by gravitation into tank B, and there to undergo a second treatment. In order to avoid confusion, the two tanks C B have been called the "double" coke-bed; and for purposes of distinction tank C has been called the "primary," and tank B the "secondary" bed. It should be stated that the effluent from the primary bed was passed through a small laboratory coke-vessel pending the preparation of the secondary bed. This coke-vessel consisted of a glass bottle of 2·75 gallons capacity, which was filled with small coke, and which had a sewage capacity of 1·25 gallons, or about 45 per cent. of that of the coke which it contained.

Method of Working and Present Condition of the Coke-Beds.—After each coke-bed has been filled from above to the level of the upper surface of the coke—a process which occupies about seven minutes for the 4-feet bed—the sewage remains in contact with the coke for three hours. The liquid is then allowed to slowly flow by gravitation from the bottom of the coke-bed—the process of emptying requiring an hour for the 4-feet bed; and the coke-bed is then allowed to stand empty for about eight hours, in order that the surface of the fragments may become aërated. In the case of the secondary coke-bed, the aëration lasted only seven hours. The coke-bed requires to be daily filled and emptied and aërated for about four weeks before it is "matured" and begins to exert its full purifying effect upon the sewage. During this interval the coke is doubtless becoming sown with bacteria, which are the active purifying agents, and which are present in large numbers in the raw sewage. This process of "maturing" the coke-bed has usually been carried on during its construction by constantly treating the coke with sewage while it is being introduced into the tank. In the earlier experiments with the single coke-bed, when it was being filled twice a day, and before it was fully matured, the bed evidently became overworked, and accordingly returned a foul effluent, and the coke itself became foul. A fortnight's rest in an empty condition restored its activity, and it has not again given any unsatisfactory results while being filled with sewage once a day, and latterly when it has again been filled twice a day. The coke-beds are not filled on Sundays. They also rested for four consecutive days, including Sunday, during the Whitsun recess, and on July 30 and Aug. 1, 5, 6, and 7—the latter rest being partly due to the necessity of repairing the sewage-pump. The coke-beds rested on five other days. With these exceptions, they have been continuously at work since the date when they were started. The surface of each working bed is broken up to a depth of several inches twice a week by being raked over; this keeps the surface open, and there is no appearance of its becoming clogged. At longer intervals, a hole extending from the surface of the bed to the bottom of the tank has been dug in the coke. The whole of the coke has on every occasion been found to be perfectly sweet when it has been thus exposed, and possesses only a slight earthy odour. The surface of the upper portion, to a depth of 3 or 4 inches, is not quite bright; but it emits no foul smell. The use of comparatively large pieces of coke in constructing the coke-bed enables the bed to hold a charge of sewage which is considerably greater than that which would fill a similar bed constructed of the smaller coke which was formerly employed. A single daily filling of the coke-bed deals, therefore, with almost as large an amount of sewage as the double daily filling of an ordinary bed. The larger size of the coke will doubtless also admit of the coke-bed being considerably deepened without losing the possibility of fully aërating the coke. It may be confidently anticipated that the larger coke and greater depth of the bed will thus enable the necessarily large amount of sewage to be dealt with. Since the single coke-bed settled down to a steady rate of working, the number of daily fillings has been raised to two, and the depth of one of the beds has been increased from 6 to 13 feet, in order to ascertain the possibility of working with deeper beds.

History of Each Coke-Bed.—The single coke-bed was filled with coke to a depth of 4 feet. It was first charged with sewage on the 22nd of April; and from that date until the 23rd of June it was charged with crude sewage twice daily, with the exception of Sundays, when it rested entirely, and of Saturdays, when it received one filling only. On the 23rd of June it was decided to give the coke-bed a complete rest for a fortnight, since both the bed and the effluent were becoming foul. There is little doubt that this foulness arose from the fact that undue work was thrown upon the bed before it had become matured. The impurities, therefore, gradually collected in the coke, since they could not be dealt with by the bacteria, which were not established in the bed at that period in sufficient number. Ultimately the impurities accumulated in the bed in such quantity as to render the purification insufficient. There is no doubt that this state is unlikely to arise in a coke-bed which is not overworked in its immature condition. After the fortnight's rest, the bed was filled only once a day, and effected satisfactory purification of the crude sewage continuously until Nov. 7, 1898. During this period the bed was stopped on certain public holidays and for the repair of the sewage pump; these stoppages amounting in all to 12 days. On Nov. 8, 1898, a commencement was made with two fillings a day, and this was maintained until Feb. 18, 1899. The results obtained by two fillings have been perfectly satisfactory. Up to the latter date, this coke-bed had been charged with raw sewage 339 times, and the one layer of coke had dealt with about 847,500 gallons of the raw sewage. The bed had, therefore, removed from the sewage an amount of solid matter which in the dry condition would weigh 32·4 cwt. This solid matter would represent 20·25 tons of sludge, containing 92 per cent. of moisture; or, taking 1 ton of sludge as occupying 33 cubic feet, the sludge removed by the bed would fill the empty coke-bed tank to a depth of 2 ft. 9 in.

The primary coke-bed for the first stage of the double treatment was charged with coke somewhat slowly, owing to the difficulty of procuring this material at the time the bed was being constructed. From July 12 to Sept. 1, the period over which the introduction of coke extended, the bed was, however, frequently charged with crude sewage, in order to carry on the maturing during the lengthened process of construction. The bed started its regular work in the treatment of crude sewage on Sept. 1; and from that date until Sept. 18 it had been filled 213 times. This coke-bed, which is 6 feet in depth, is now producing an effluent in which the purification is practically the same as that effected by the single coke-bed, which is 4 feet in depth. It may therefore be inferred that the purification effected by the bed will not be diminished when its depth is still further augmented.

For the second stage of the double treatment, the secondary coke-bed was matured by treatment with sewage during its construction. It received its first charge of raw sewage on June 2, and was worked until Aug. 31 as a single crude-sewage coke-bed. During that period it received 60 fillings of raw sewage, and 244,200 gallons of sewage in all were passed through it. It removed from the sewage an amount of solid matter which in the dry condition would weigh 9·35 cwt. This solid matter would be equivalent to 5·85 tons of sludge, containing 92 per cent. of moisture. Since Sept. 1 this coke-bed has been used as a secondary bed, and has received the effluent from the primary bed, and subjected it to a second process of treatment. Since the primary effluent is usually clear, this secondary bed has been spared the process of removal of solid suspended matter, and has exerted all its purifying action upon the dissolved oxidizable matter. Since the secondary bed has been in operation, the use of the small laboratory vessel has been stopped.

Experimental Proof of the Aëration of the Coke-Beds.—In order to ascertain whether the surface of the fragments of coke became fully aërated throughout the bed between the successive chargings with raw sewage, two vertical pipes were inserted into the bed, reaching to the depths of 6 feet and 13 feet respectively. After the sewage had flowed away from the bed, samples of air were drawn off from the interspaces between the coke fragments at stated intervals, and the percentage proportions of oxygen and carbonic acid were estimated in this air. The results, which in the case of the 13-feet depth were only of a preliminary character, indicated that even after the air had been in contact with the lower strata of the coke for 70 hours, the air still contained an average of about 75 per cent. of its original oxygen, and the average amount of carbonic acid did not exceed 3 per cent. This evidently represents an entirely satisfactory condition of aëration of the coke surfaces.

Variation in the Condition of the Crude Sewage and its Effect upon the Effluent.—The sewage which has been subjected to the above treatment has varied much in character, as judged by the amount of suspended matter and of dissolved oxidizable matter which it contains. The effluent derived from this sewage appears, as a rule, to have undergone a variation corresponding to that of the sewage from which it has been produced. The occasional diminution in the percentage purification does not appear to be due to an acid reaction of the sewage hindering the bacterial action, since the sewage is always either alkaline or neutral in reaction. Neither is this diminished purification apparently to be referred to the presence in the sewage of undue proportions of chemical refuse derived from gas and chemical works. No evidence has been obtained of interference with the normal action of the coke-bed from such causes. It appears, however, very probable that the purification of the raw sewage is most complete when the sewage is in a fairly dilute and fresh condition. The least satisfactory results were obtained during the hot, dry weather of the recent summer, when the sewage arrived at Crossness less dilute, owing to the absence of rain, and in an offensive and putrescent state owing to the high temperature of the air. Even when the sewage was poured upon the coke-beds in this offensive condition, the effluent from the beds was not

offensive in character, and it did not become so when it was kept. It differed from better effluents only by containing a larger amount of dissolved oxidizable matter.

Relative Purity of Clear Sewage, Chemical Effluent, Coke-Bed Effluents, and Lower River Water.—The relative amounts of dissolved putrescible matter in the sewage, the chemical effluent, and the coke-bed effluent, as measured by the oxygen which they absorb from permanganate, are as follows:—

	Impurity of Liquid.	Percentage Purification Calculated on Raw Sewage.
Raw sewage	3·696	..
Chemical effluent	3·070	16·9
Coke-bed effluent (single treatment)	1·799	51·3
Coke-bed effluent (double treatment)	1·137	69·2
River water, high tide	0·350	..
River water, low tide	0·429	..

A comparison of these numbers with one another shows that, by substituting a single coke treatment for chemical treatment, the effluent sewage discharged into the river would be completely free from suspended impurity, and would possess a purity, as regards dissolved putrescible matter, of 51·3 as compared with 16·9 in the present effluent; representing an improvement of 67·1 per cent. If discharged after double treatment in the coke-beds, the percentage improvement on the chemical effluent would be 75·6. The bacterial action continuing in the river would rapidly bring the purity of such a liquid into a condition equalling that of the river water itself.

In the third section of his portion of the report, Dr. Clowes tabulates the results of the chemical examination of the raw and the bacterially-treated sewage.

The second division of the report contains the results obtained by Dr. Houston in his bacteriological examination of the Crossness crude sewage and of the effluents from the coke-beds. The report, which is very elaborate, is accompanied by a number of diagrams and plates of reproductions of micro-photographs specially taken by Dr. Albert Norman.

THE MECHANICAL FILTRATION OF WATER.

Among the subjects dealt with at the last meeting of the American Society of Civil Engineers, was the mechanical filtration of water. It was introduced by Mr. E. B. Weston, who reviewed the work of a mechanical filter of the Jewell gravity type, constructed under his direction for the East Providence Water Company. The following notes of his remarks are taken from the "Engineering Record."

The Company's supply is 200,000 gallons a day; and the average capacity of the filter is 500,000 gallons daily. The plant contains several novel features while retaining the marked characteristics of the Jewell system. In the bottom of the filter-house there is a concrete basin holding the filtered water. Above this is a circular wooden tank containing a sedimentation basin in its lower portion with the sand filter above. The power for driving the mechanical features of the plant is furnished by a turbine in the basement of the pumping-station. The sand employed is crushed quartz used in a bed 3 ft. 8 in. thick. The capacity of the sedimentation basin is equal to a flow of about 17 minutes' duration when the filter is operated at its normal rate of 125 million gallons per acre per 24 hours. The flow of water from the tank is regulated within one-half of 1 per cent. by a new form of controller. The filter was run throughout the test under ordinary working conditions, and the filtered water was pumped directly into the mains. The chemical analyses were made by Professor J. H. Appleton, of the Brown University, and the bacteriological work was done by Dr. Gardner T. Swarts, the Secretary of the State Board of Health of Rhode Island, who also determined the colour and alkalinity of the samples. These were collected about eight o'clock in the morning, two hours after the filter-bed had been washed.

The coagulant used during the test was sulphate of alumina, prepared by dissolving a part of the sulphate in about 20 parts of filtered water. The solution was always thoroughly mixed before being used. The filter was first put in service on the 25th of February last, and it has been in regular operation since that date. The test was begun on the 13th of March, which was as early as a known grade of sulphate of alumina could be procured. The coagulant added previous to this date was of an inferior grade. That used during the test contained about 22 per cent. of alumina, except during one special experiment, when an inferior and cheaper grade containing about 17·53 per cent. was used. The sulphate was added to the raw water at the rate of a grain per gallon, except during three special experiments, when 0·75 and 0·6 grain per gallon were tried. The system of operation of the filter-plant did not differ from the usual plan followed in such works.

The bacteriological results obtained with the use of a grain of sulphate per gallon of raw water, filtered at the rate of 125 million gallons per acre per day, were equivalent to the removal of 96·62 per cent. of all the bacteria in the raw water. The average result was very high, and the chemical improvement of the water was also marked. Averages of various tables submitted by Mr. Weston show that there were 99·2 per cent. less bacteria in the filtered water than in the untreated supply, 6 per cent. less total solids, 1 per cent. less chlorine, 61 per cent. less ferric oxide, 38 per cent. less aluminic oxide, 29 per cent. less free ammonia, 63 per cent. less albuminoid ammonia, 83 per cent. less colour, and 20 per cent. increase of hardness. In every instance the filtered water was more or less alkaline; and consequently the raw water was more than able to decompose a grain per gallon of sulphate of alumina which was added to it.

The special experiments were not completed at the timeof the meeting; but the results of several of them were communicated to the Society. For six days in March, the sulphate was added at the rate of 0·75 grain per gallon, and resulted in reducing the bacteria from 1768 per cubic centimetre in the raw water to 28 in the filtered water, corresponding to a percentage reduction of 98·32. The colour was reduced about 79 per cent. For four days in March the sulphate was used at the rate of 0·6 grain per gallon. Under these conditions, the number of bacteria was reduced from 875 to 9, or 98·75 per cent., and the colour was reduced 73 per cent. During the first six days of May, the sulphate of alumina was applied at the rate of 0·75 grain per gallon, and resulted in a reduction of the number of bacteria from 360 to 19, or 94·03 per cent., and the reduction of the colour about 75 per cent. During the first seven days in June, a low grade of sulphate, containing 17·53 per cent. of aluminic oxide, was applied at the rate of a grain per gallon, and resulted in a reduction of the bacteria from 640 to 15, or 96·82 per cent.

It will be noticed that the percentage of bacterial reduction in May, when 0·75 grain per gallon of coagulant was used, was considerably less than during the trial in March, when the same quantity of sulphate was employed. Mr. Weston stated that the difference might be partially accounted for by the fact that the average number of bacteria in the raw water was nearly five times as large in March, when the more favourable results were obtained, as during the less satisfactory period in May. The principal cause, however, was due to the sample of filtered water taken on one of the days in May containing a larger number of bacteria than was found in other samples taken during the test. The number was 61; and as the raw water on the same day contained but 298, the percentage of reduction was only 78·89, which, being averaged with the percentages of the remaining five days, brought down the total average to the amount stated.

When the percentages of reduction of bacteria fell below 98, the filter was working at a disadvantage for such a comparison, on account of the small number of bacteria in the raw water. The average number in the filtered water was less than 5 per cubic centimetre, which is remarkably small, and shows that in studying the work of this particular plant a comparison based on percentages of bacterial reduction is not fair.

The cost of operating the filter since it was first put in service has been practically the cost of the sulphate used, for no labour was required beyond that already employed at the pumping-station. The operating expenses, therefore, based on a use of a grain of sulphate per gallon, work out at about $2·15 per million gallons of filtered water. The total cost of the filter plant is estimated at about $11,500. If the three additional filters should be added for which the house was designed, the cost of the completed plant, of a capacity of 2 million gallons per 24 hours, would be about $21,000, or $10,500 per million.

Amendment of the Workmen's Compensation Rules.—In the "Journal" for July 5 last year we noticed the issue of the rules framed in accordance with the provisions of paragraph 10 of the second schedule to the Workmen's Compensation Act, 1897. Additional rules, and amendments in those already in use, have since been made; and they will come into operation on the 1st prox. The time for the service of the request for arbitration under Rule 15 is extended from ten to fifteen days, and the time for filing the answer from five to ten days, before the arbitration. Other amendments refer to the payment of costs to solicitors. The amendments have been issued by the Queen's Printers.

The Progress of the Welsbach System of Public Lighting.—Recent issues of the "Municipal Journal" contained an interesting series of articles on the above subject, prepared from returns supplied by the officials of Municipal Corporations, District Councils, and London Vestries. The articles have now been issued in a separate form at the price of a penny. The inquiries instituted by our contemporary have proved conclusively that the Welsbach system means vastly better light at greatly reduced cost, but not when it is employed in conjunction with the old-fashioned lanterns and improper burners. It is shown that whatever fault there may be, does not lie in the system but in its treatment; and an indication is given as to how mistakes can be avoided and success assured. Particulars are furnished of the installations of Welsbach lighting in London, Liverpool, Leicester, Ipswich, and Aston Manor; Mr. Livesey's scheme for South London is described; and there are tabulated details of the experience of a number of Corporations and Urban District Councils with the incandescent and ordinary systems of gas lighting. A list is also given of towns in which experiments are now being made.

REGISTER OF PATENTS.

APPLICATIONS FOR LETTERS PATENT.

20,256.—Ginnasi, F., "Acetylene gas generators." Oct. 9.
20,269.—Johnston. J., "Gas and petroleum engines." Oct. 10.
20,323.—Marks, G. C., "Gas-engines." A communication from J. P. Murphy. Oct. 10.
20,325.—Marks, G. C., "Gas-engines." A communication from J. P. Murphy. Oct. 10.
20,333.—Thompson, W. P., "Gas-burners." A communication from Fischer and Rector. Oct. 10.
20,354.—Llorens, J., "Generating acetylene." Oct. 10.
20,360.—Marshall, J., "Chimneys for gas or other lights." Oct. 11.
20,378.—Harpin, W., "Incandescent gas-fire." Oct. 11.
20,420.—Clay, W. R., "Incandescent gas-burners." Oct. 11.
20,423.—Murinick, A., "Incandescent gas-burner." Oct. 11.
20,432.—Grundy, R. C., D. R., & D., "Automatic valves for water and other fluids." Oct. 11.
20,494.—Mazza, E. N., "Separating and extracting gases from a gaseous mixture, purifying gas, and increasing its illuminating power." Oct. 12.
20,497.—Pieper, H., jun., "Gas and other engines." Oct. 12.
20,507.—Arnswaldt, H. von, "Electric igniter for gas." Oct. 12.
20,515.—Falk, S., "Bunsen burners." A communication from M. Ahrendt. Oct. 12.
20,522.—Tee, H., "Gas-lamps." Oct. 13.
20,570.—Lanchester, F. W., "Gas and oil engines." Oct. 13.
20,602.—Melhuish, A. G., "Gas and oil engines." Oct. 14.
20,604.—Richmond, E. W. T., "Gas-heated water-heaters." Oct. 14.
20,622.—Schreck, P., "Acetylene gas generators." Oct. 14.
20,625.—Wynne, W. R., "Gas and oil engines." Oct. 14.
20,641.—MacKean, W., "Incandescent gas-burners." Oct. 14.
20,658-59-60.—Naef, P., "Producing coke, gas, and bye-products." Oct. 14.
20,664.—Lake, H. H., "Gas or like engines." A communication from the Standard Automatic Gas-Engine Company. Oct. 14.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Sunday Labour in Gas-Works.

Sir,—Your "Editorial Note" upon Mr. George Livesey's paper concludes by observing that, to dispense with Sunday carbonizing, "a certain amount of reserve producing or storage power is essential. This means capital outlay. The municipalization of gas undertakings usually has the effect of sparing the outlay of capital on 'unnecessary' luxuries. Is the reduction of Sunday labour one of these?" I think I have heard that the instinct of economy is as strongly developed in sliding-scale companies as in corporations; but putting distinctions and comparisons aside as being scarcely worthy of the subject, may I be allowed to answer your question so far as Birmingham is concerned.

So far as I am aware, no effort was ever made by the two Birmingham Gas Companies to reduce the hours of Sunday labour, with the exception of granting a holiday once a month as a reward for regular attendance. But on the 1st of January, 1876, the Corporation came into full possession of the two undertakings; and in a little more than two years from that date, and at the instance of the Corporation through their Gas Committee, the abolition of Sunday carbonizing between 6 a.m. and 6 p.m., except in cases of emergency, became an accomplished fact. Pecuniarily the men were losers by the change, because we continued to pay them at the same rates for the actual time worked. But I well remember overhearing a remark made by one of the men, who was not aware of my presence, that it was the best thing that had ever happened on the works; and I believe that this expressed the prevailing sentiment. Within the last year or two, and upon the application of the men themselves, the time during which carbonizing work is suspended has been extended to 10 p.m. during the summer months. It may be true, as you state, that the demand for extra pay for Sunday work is not altogether above suspicion; but whether this be so or not, it is at least equally true that this extra pay, by its appeal to the pockets of the employers, operates as a further security for the maintenance of the privilege of Sunday rest. This can hardly have been overlooked by the men as a possible result of their action.

I should like to add that it has always appeared to me that the cessation of Sunday carbonizing for twelve or even sixteen hours does not, as appears to be generally supposed, necessarily involve the provision of an increased amount of storage room, but that what is required is additional manufacturing plant; the reason for this being that a reduction of the make on Sunday may be most conveniently met by an increased make during each week day, so as to bring about a nearer approach to equality between the daily production and output. It may, in fact, be made to dispense with a certain amount of storage, although not perhaps of the equivalent value of the additional manufacturing plant required.

Charles Hunt.

Birmingham, Oct. 20, 1899.

Gas for Motor Purposes.

Sir,—In reference to my paper on the above subject, read before the Gas Institute in June, I shall be glad if you will allow me to make the following additions.

I am informed by the makers of the Dowson gas plant in Liverpool, on which my tests were made, that the plant was not being worked according to their instructions, which state that the generator should be clinkered every 10 or 12 hours, instead of every 48 hours, as was the case when I tested. The results obtained, therefore, after ten hours' life of the fire cannot be regarded as normal.

My calorific tests are given per cubic foot corrected to 60° Fahr. and 30 in. pressure. These, to compare with the figures quoted from Mr. Dowson's paper, should have been based on the cubic foot reduced to 32° Fahr. and 29·9 inches pressure; bringing up the average calorific value from 149·2 B.T.U. to 157·4 B.T.U.

I would also point out that the heat efficiency of a plant consisting of two small generators, one of which is idle during the night, cannot be as high as that of one generator of double their size working continuously.

T. O. Paterson.

Birkenhead, Oct. 19, 1899.

Coal v. Water Gas and Naphthalene Deposits.

Sir,—In connection with the instructive Botley-Young correspondence which is appearing in your columns, I have thought the following statement might be of some interest: For the last fifteen years my output has consisted of 20 per cent. of carburetted water gas. The water-gas plant is situated a mile from the main coal-gas works; and a portion of the water gas is pumped into a holder about 1½ miles from those works. This holder also receives its supply from them; so that two-thirds of the city are served with a mixture of coal and water gas and part with pure carburetted water gas, the other one-third with pure coal gas. In the part supplied with coal gas, I am troubled in the fall of every year with naphthalene stoppages in the mains and services; but in that supplied with a mixture of coal and water gas and pure water gas I never have a single case.

Jas. Somerville.

Indianapolis (Ind.), Oct. 10, 1899.

LEGAL INTELLIGENCE.

Assessment of the Liverpool Water-Works—Prolonged Litigation Terminated.

At the Montgomeryshire Quarter Sessions at Welshpool last Thursday, Mr. A. C. Humphreys Owen, M.P., presiding, the only business was the case of the *Corporation of Liverpool v. The Overseers of the Parish of Llanwddyn and the Assessment Committee of the Llanfyllin Union.* The matter in dispute, which has been before the Courts during the past two years, was the rating of the Corporation Water-Works at Lake Vyrnwy, Montgomeryshire. The case arose through the Corporation appealing to have the gross value of their undertaking in the parish of Llanwyddyn reduced from £19,500, and the rateable value from £15,322. The Court, in dismissing the appeal, agreed to state a case for the Higher Courts. The Queen's Bench Division quashed the decision; and instead thereof ordered that judgment should be entered at sessions for the appellants with costs, and that the rate of assessment should be £12,037 gross, and £9630 net. The matter was afterwards taken to the Court of Appeal, which reversed the decision of the Divisional Court, and at the same time varied the order of Quarter Sessions by reducing the gross rental to £17,258 and the rateable value to £13,806. In this form the case was remitted to Quarter Sessions, and last Thursday Mr. T. G. Horridge, for the appellants, asked that the judgment of the Court be entered accordingly. He at the same time applied for costs, on the ground that the Court had decided that the respondents had assessed the appellants' property on an erroneous basis. Mr. F. Marshall, Q.C., with whom was Mr. Ellis Jones Griffith, M.P., opposed the appellants' application for costs. After hearing read the order of the Court of Appeal and the arguments of Counsel on the question of costs, the Court ordered that the order of Sessions be varied by reducing the gross rental of the appellants' property to £17,258, and the rateable value to £13,806. They made no order as to costs.

Water Consumers' Liability for the Cost of Searching for Leakage.

At the Southwark County Court a few days ago, before His Honour Judge Addison, Q.C., Messrs. Peek, Frean, and Co., of Bermondsey, sued the Southwark and Vauxhall Water Company to recover £2 7s. 5d. damages, for the wrongful service of a notice stating that one of the plaintiffs' pipes had burst, and calling upon them to trace the same and repair it. Mr. Goodman appeared for the plaintiffs; Mr. Hurd represented the Company. Plaintiffs' case was that they received the notice, requesting them to carry out the work within 48 hours, failing which they would be liable to a £5 penalty, and the Company carrying out the work at their expense. They employed men who opened the ground and "searched" the pipe, but could not find a leak or any trace of water having escaped. They expended £2 7s. 5d. upon the work, which they now contended ought to be paid to them by the Company, on the ground that they compelled them to carry out the work when there was no real necessity for it. Evidence was given on behalf of the defendants that several of their men found at different periods, by means of sounding-rods, which were infallible tests, evidence of a positive leak in the service-pipe. They attributed the failure to the plaintiffs' men to find the leak to the theory that they might have bent the pipe when taking up the ground, and thus have jammed the fissure. His Honour held that the Company had reasonable grounds for believing that there was a leak; and he gave judgment for the defendants, with costs.

Fraudulent Consumption of Gas at Mansfield.

At the Mansfield Petty Sessions last Thursday, Matthias Baker was charged with fraudulently using gas on the 14th inst. The evidence of Mr. Arthur Graham, the Gas Manager, was to the effect that he visited defendant's shop and premises about 7 o'clock on the previous Saturday evening. He asked the defendant for permission to examine the prepayment meter he was using. He found it in perfect working order. One light in the shop was derived direct from the meter; but he also noticed a light in the kitchen. Subsequently he went in company with a police-sergeant into the cellar; and there he found that a connection had been made, by means of a brass tap attached to a ½-inch plug in the service-pipe, away from the gas-meter—there being also a length of rubber tubing attached. On turning off the tap, the light in the kitchen went out; but there was still a light in the shop. When accused of the fraud, defendant tried to excuse himself by saying that the connection had been made by a young man without his knowledge. The Bench inflicted a penalty of £2.

MISCELLANEOUS NEWS.

THE NEW GAS-WORKS FOR EDINBURGH AND LEITH.

Laying the Foundation Stone.

The ceremony of laying the foundation stone of the new gas-works which are being erected for the Edinburgh and Leith Gas Commission at Granton, was performed on Monday, the 16th inst., by Mrs. Mitchell Thomson, the wife of the Lord Provost of Edinburgh. A party of nearly 300 invited guests travelled by special train from the Waverley station to Granton, from whence they drove to the site of the works, nearly a mile distant.

The works are being erected to plans—architectural and engineering—and specifications prepared by Mr. W. R. Herring, the Engineer to the Commission. Immediately the Commissioners gained possession of the site (just twelve months ago), steps were taken to make a connection with the Caledonian Railway system, which crosses the south-east corner of the site, and also the North British Railway system, which was some three-quarters of a mile distant; the connection of the remainder being laid by the Duke of Buccleuch as part of the land purchase bargain. The excavations for the gasholder tank were also commenced early in November; and the earth therefrom was utilized to form the railway embankments and for the filling up and levelling of the site, excepting where the buildings and other erections were to be placed. It may be remarked that the railway at present laid constitutes the whole of the branch railways for two complete sections of the works, and is 2¼ miles in extent. Immediately the railways were in position, the construction of the heavy foundations for the various buildings were commenced. The foundations consist principally of concrete piers projecting from the solid ground at about 24 feet centres, with concrete arches intervening from pier to pier to carry the superstructure. An extensive main drainage scheme is also close upon completion; the pipes being laid at a sufficient depth to drain the deepest portions of the basements of the various buildings, coal-breaking pits, &c., and also in such a position as to take all surface water and effluents over an area of 35 acres. It is continued in the form of a 24-inch pipe along the north boundary wall, turning at right angles through the residual products works site, which will be drained into the same drain, and running out to sea to low-water mark; the 24-inch pipe being intended to drain the whole of the area as it will become occupied from time to time. In connection with the formation of the foundations, the work has been done under labour contracts only; the Commissioners supplying the whole of the materials. They have also erected a large stone-breaker for breaking stone and ballast for the concrete, and also introduced a concrete-mixing machine. The works immediately in process of construction consist of a section capable of producing 6½ million cubic feet of gas per day. The retort-house will measure 396 feet by 106 feet, with an annex of two floors at one end, 101 feet by 82 feet, within which will be contained (on the ground floor) workshops and machinery rooms containing hydraulic and air compressing pumps, tar, liquor, and water pumps, and the main power for driving the coal elevators, conveyors, and the coke transport appliances—the latter consisting of a narrow gauge railway with tipping waggons propelled by a continuous cable running on to an overhead gantry in the coke-yard—the waggons discharging over screens into railway trucks, or on to the permanent stock, and returning by a circular route to the retort-house level again. On the first floor will be the exhauster and engines, together with a complete suite of workmen's rooms. Above these will be placed spacious water-tanks, within which some portions of the condensing apparatus will be fitted. The retort-house is to be equipped with 56 settings, each of nine retorts 20 feet long, in four complete sections, with automatic air-condensing tubes arranged in the roof. The adjoining space intervening between the retort-house and coal-store, 70 feet wide, is covered by a roadway, two lines of railways, &c., upon which there is sufficient standing room for a whole day's supply of coal (650 tons). The waggons discharge by hydraulic power into the coal-breakers at the centre of the retort-house; and the empties pass forward into the coke yard for loading with coke or ashes. The building running parallel with the retort-house will be 500 feet by 96 feet. At the north or coke-yard end, the boilers will be fitted with automatic appliances for feeding the furnaces and the removal of ashes. At the south end there will be a plant-house, 93 feet by 96 feet, within which the whole of the remainder of the condensing plant (of the water-tube type), scrubber-washers, and cyanide plant will be contained. At the south end of this building, the coal to be put into stock will be discharged into an elevator, which is intended to feed two lines of conveyors running the full length of the coal-store. The purifier-house is to be constructed entirely of ironwork, with an overhead floor and roof, and with special appliances for discharging the lime into railway waggons, which run upon both sides of the lines of boxes. A gasholder tank now in course of construction will, upon completion, be 252 ft. 6 in. in diameter by 36 feet deep. A splendid foundation has been found upon the hard blaes; and it is being constructed of brick in cement and puddle backing. As at the outset some uncertainty prevailed as to being able to get a sufficient quantity of ballast and cement for the work, the idea of constructing a concrete tank had to be abandoned; but there is little doubt that all future tanks will be constructed of concrete, as the Commissioners are at the present time engaged in opening a large stone quarry—very valuable beds of stone having been found beneath the site, the larger pieces of which will be used for building and the ballast laid aside for future works in concrete. The gasholder itself is also in course of construction, and when completed will contain 6,562,000 cubic feet of gas. The pipes and connections leading to the holder will be 48 inches in diameter; and the connections from the new works to the present distributing station, about 2½ miles distant, will also be of this size. It is hoped that the gasholder will be finished by the end of September, 1900, and thus be available for use in conjunction with the present works to tide over the winter of that year.

The foundation stone was laid at the north-east corner of the retort-house. When the visitors arrived, they found the stone—a sandstone block weighing 1 ton—swinging over its future bed. Lord Provost Mitchell Thomson presided at the ceremony. Prayer having been offered up by the Minister of the parish,

The Lord Provost said: The interesting event which has brought us together on the present occasion naturally turns our thoughts to the past as well as to the future. Dealing with such a subject as artificial light, it is surprising how few glimpses we get of the methods of our remote forefathers as to this particular subject. In 1554, the Town Council ordered lanterns to be hung in the streets and kept burning by the inhabitants from 5 to 9 p.m. Again, in 1684, they ordered a lantern and candle to be hung out of the first storey of every house, and to be kept alight from 5 to 10 p.m. in winter. Those who went abroad after the latter hour required the help of linkboys or torch-carriers to light them home. The general use of torches for this purpose, or for paying homage to fashion, down even to comparatively recent years—is illustrated in the torch-extinguishers which at one time stood at the door of all the best houses of the new town. Some striking examples of these are still to be seen in Melville Street. Some time after 1684, the Corporation provided crystal lamps with oil for the streets. This continued down to March, 1820, when the streets of Edinburgh were for the first time lighted with coal gas; the Corporation, with commendable economy, simply withdrawing the oil from the crystal lamps, and inserting a cockspur gas-jet instead. The local magazines of the day were loud in their praise of the new illuminant. Two years before this—viz., May 23, 1818—the Edinburgh Gaslight Company had been incorporated by Act of Parliament "for lighting the city and suburbs, and places adjacent, with gas." The names of the applicants for parliamentary powers (twenty-four) embrace gentlemen well known in the social, civic, literary, professional, and business circles of Edinburgh, headed by the Lord Provost of the time, the Right Hon. Kincaid Mackenzie. The request was granted by Parliament under well-considered, if somewhat stringent, regulations, giving a model which has been closely followed in subsequent Acts, to which I have yet very shortly to refer. In 1822, the burgh of Leith followed the example of Edinburgh, and got an Act incorporating the Leith Gaslight Company for lighting the town of Leith and its vicinity with gas, and for other purposes relating thereto. In 1824, the Edinburgh Oil-Gas Light Company obtained an Act incorporating them for the better lighting with oil gas of the city and suburbs of Edinburgh and places adjacent. Curiously enough, at this time the Leith Gaslight Company were manufacturing oil gas and supplying Edinburgh, though it was 1829—five years after—before they got permission from the Edinburgh Corporation to extend their pipes within the royalty. The Edinburgh Oil-Gas Company failed; and the Edinburgh Gaslight Company purchased the Oil-Gas Company's property, which had cost £60,000, for £21,125 of their own stock at par. This bargain turned out a capital one for those who held on to their shares till 1888, but, like some more of his investments, brought considerable loss to Sir Walter Scott, who was the first Chairman of the Company, and did his best for its success. It is interesting to know that the copper-plate inscription placed in the foundation stone of the Oil-Gas Company's works at Canonmills hangs on the walls of the Commissioners' room at No. 25, Waterloo Place. On March 23, 1829, the Edinburgh Gaslight Company obtained a second Act, enlarging their capital, empowering them to manufacture gas from any material capable of producing it, limiting the maximum dividend to 10 per cent. per annum, "ay and until there be another company incorporated by Act of Parliament or otherwise for the supply of the city and suburbs of Edinburgh and the places adjacent with coal gas," and appointing the Master of the Merchant Company and the Accountant of the City of Edinburgh as Auditors of the Gas Company's accounts, to see that surplus profits were used only in reducing the price charged to the public for their gas supply. This wise provision did not apply for any very considerable period. On March 23, 1840, the Edinburgh and Leith Gaslight Company was incorporated "for the better lighting with gas the city of Edinburgh and town of Leith, and places adjacent." The promoters of this Act were drawn largely from the mercantile and professional circles of the city. Sir James Forrest, of Comiston, Lord Provost of the city, was Chairman. The provisions of the Act were practically identical with those of the Edinburgh Gas Company. The passing of the Edinburgh and Leith Gas Company's Act, empowering them to supply Edinburgh as well as Leith, compelled the Edinburgh Gaslight Company to go to Parliament once more for additional powers. These they obtained, curiously enough, on the same day as the Edinburgh and Leith Company obtained theirs—March 23, 1840. By this Act, the capital was increased by £50,000, with the power of borrowing a further sum of £50,000; while the area of possible supply was extended so as to include, not only Leith, but the parishes of Newhaven, Cramond, Liberton, Duddingston, and Portobello. The passing of the two Acts of 1840 ends the ancient parliamentary history of gas lighting, so far as the Companies were concerned. For the unusually long period of 47 years neither of the Companies appeared in Parliament. For 26 years (1840-66) there was keen and costly competition, for which in the end the public had to pay. The streets had to be torn up twice as often as should have been necessary. Duplicate distributory plant was laid down, smaller than would otherwise have been employed—thus sooner becoming inadequate. This wasteful contest went on vigorously till 1866, when a working agreement was come to, formally renewed year by year, by which the Companies mutually arranged to "district" the town, to cease canvassing for customers at the removal term, and only to lay one set of pipes in new streets, to be done by each Company in its respective district. This arrangement was carried out with wonderfully little friction, and with advantage both to the Companies and to the public, from 1866 to Aug. 1, 1888, when the transference of the Companies to the Commissioners gave to the public whatever benefit might accrue from united economical management. But on the modern history of the gas undertaking, I will not now enter. I leave that to Bailie Kinloch Anderson, Convener of the Works Committee, who has been a Commissioner since the formation of the Trust.

Bailie Kinloch Anderson and Bailie Manclark, of Leith, the two Conveners of Committees, placed the leaden drum, inside which was a glass case containing the customary articles, in the cavity below the stone. Among the articles so put away was a copy of the "Journal" for the 10th inst. Bailie Kinloch Anderson presented a silver trowel and a mallet, bearing suitable inscriptions, to Mrs. Mitchell Thomson. The stone was then lowered into position; being guided into place by Mr. Herring and Mr. H. H. Gracie, draughtsman at Granton. Ex-Bailie Steel, of Edinburgh, having applied the level and plummet to the stone, announced that it had been properly laid. A glove was placed upon the stone, which Mrs. Mitchell Thomson tapped three times, and then said: "It is reported that

this stone is well and truly laid." A magnificent bouquet of chrysanthemums and other blossoms was presented to Mrs. Mitchell Thomson by Miss Esmé Herring. Bailie Manclark, on behalf of the Commissioners, thanked Mrs. Mitchell Thomson for the manner in which she had laid the stone; and the Lord Provost returned acknowledgment.

Mr. A. Dewar, M.P., said he was delighted to have the privilege of proposing the sentiment of "Success to this great undertaking." That there would be success, he had no doubt. It might not be beyond the bounds of possibility that when, in future ages, some antiquarian dug down there and found Acts of Parliament which showed that the Commissioners had had to go to London for power to do what everyone knew they were quite capable of doing at home, they might stand in open-mouthed astonishment at the patience of the people of Scotland in this matter. He thought they might anticipate that prosperity would come, because no better site for a gas-works could have been got in the universe—overlooking the Firth of Forth, where the prevailing winds would blow all offensive vapours out to sea—and they had it on the very best authority that there would be a very great saving to the town, not only financially, but also in the matter of health.

The Lord Provost presented Bailie Kinloch Anderson with a silver box containing a list of the articles enclosed in the casket, and to Bailie Manclark, the Convener of the Finance and Law Committee, a silver salver—both bearing inscriptions—as mementoes of the occasion.

Bailie Kinloch Anderson, in returning thanks, said that though, when they took over the gas undertakings in 1888, probably many of them thought that they could have done with a price quite £100,000 less, still a majority in the Corporations at that time were of opinion that they had a very fair bargain, and that there were prospects of an increased demand for gas. This opinion had been quite justified. They had had a continued flowing tide of success. They could not, as Commissioners, claim the entire credit for this; but they did say that they had most attentively and assiduously done the work of the Commission. Since they took up the business of gas supply, the consumption had increased by no less than 47 per cent. In 1886, the Edinburgh Gas Company applied to Parliament for power to build new works. They then believed that the Edinburgh works were insufficient for their purpose; but after the Commission took the matter in hand, they turned to the best account the little available appliances they had, and they had been able to meet an enormously increasing business. The revenue had augmented by £47,500; and this increase would have been very much more but for the fact that the Commissioners saw that they were justified in reducing the price of the gas by 6d. per 1000 cubic feet. This represented £40,000 a year. They not only did this, but in the early days of the Commission they then abolished meter-rents, which meant a reduction to gas consumers of £10,000 a year. After the Commission was formed, they revised the wages of their workmen; and they were now paying under this head, an additional £18,000 a year, of which from £10,000 to £12,000 was due to increase of wages, and the balance to extra business. The Gas Commissioners had spent about £180,000 of capital—very largely for the extension of mains. The sinking fund, the reserve fund, and the balance they had on hand at the present time represented the large sum of £157,400. Two or three years ago they experienced a slight startle, when the Corporation of Edinburgh went in for the electric light. They thought their industry was doomed, and that there would be no necessity for Gas Commissioners shortly; but it was very strange to relate that the increase in the consumption of gas since the electric light had been in force had been greater, proportionally, than it was immediately before. This was, to his mind, accounted for in the first place by the fact that they had done a great deal in encouraging the adoption of gas fires and cookers. They had thousands and thousands of them in use now; and they were regarded, by those who had tested them, as of great utility. Besides this, it was found that people who did not introduce electric light used, in competition with those who did, sometimes as much as double the quantity of gas which they burnt before. The new works were a matter of the utmost importance in respect to the future gas supply of the district. They thought well over the scheme before they put it before the public. As fate would have it, they had to change their Engineers, both of whom they regretted; and they had to look out for a successor. He said, there and then, that it was one of the very best strokes of fortune the Gas Commissioners had had, that they were able to secure the services of Mr. Herring. Mr. Herring did not take long in surveying the situation. He knew the condition of affairs, by report. He verified matters for himself; and after a number of consultations with them, a scheme was matured, and a representation was made to the Commission to the effect that they should at once look out for suitable ground upon which to build a new gas-works. Mr. Herring argued that by the application of the most modern appliances (the plant they had at present being pretty well obsolete), they could save a great deal of money. After inquiry, within six months they purchased the present site; they obtained the requisite parliamentary sanction; and the work had been begun, in connection with the great undertaking.

Bailie Manclark also returned thanks.

Sir Andrew M'Donald, in proposing a vote of thanks to Mr. Herring, said that the Commissioners were exceedingly fortunate in fixing upon him. Mr. Herring, in the gas world, was a perfect giant. He was not very long in charge before he found that the Leith works were not at all up to date. He also discovered that the Edinburgh works were rather worse; and that, along with this, they were highly dangerous to the community. Mr. Herring's contention was that they must remove from there, which they had agreed to do. Perhaps they had gone to Parliament a year or so too soon; but their friends in Parliament might cure this. He meant that if they had gone a year or two later, they might have got the land for nothing. They would see at a glance that this would have been a very great saving. But perhaps the men who could do this could also make the Bill retrospective—say, for five years. The Commission were in such a tight place that they could not keep up the supply of gas; and they felt that they must go on. He was sure they all wished Mr. Herring would have health spared to him which would enable him to complete these great works. He was a perfect master of them. He had the whole thing in his hand; and he was sure Mr. Herring would produce a gas-works that would attract the whole of the corporations in the country who wished either to build new works or to enlarge old ones. Mr. Herring had given the Commission, from first to last, the highest satisfaction; and they, in turn, he hoped, would see that, not overburdening him, he should have fair play in the manipulation of the works. If they did so, he was sure that Mr. Herring would produce something that Edinburgh would be proud of.

Mr. W. R. Herring thanked the company for the very cordial manner in which they had responded to the vote of thanks proposed by Sir Andrew M'Donald in such generous terms. He could assure them that he felt it a very high honour indeed to have been called upon to carry out these great works for such a distinguished city. It had been said that "opportunity made the man." So far as his own career was concerned, he must admit he had been blessed with several very fine opportunities. He need hardly say that this last was the greatest of them, and that his object would be to create such a works as would be in unison with the expressions which Sir Andrew M'Donald had used. He was sure that he had the confidence and the support of the Gas Commissioners; and he thought it only fair to say that he had found the Commissioners to be an excellent body of business men, and most assiduous in their attention to the duties of the Commission. Many of them were practically and technically acquainted with branches of engineering work which fell to be considered in the construction of such a works. Added to this, they had an indefatigable executive Chairman, in the person of Bailie Kinloch Anderson. With a body of men like this at his back, no one need have any fear in pressing forward to the completion of such a works as these. The stone which they had seen laid by Mrs. Mitchell Thomson was an emblem of the unity which was to be evolved from the work going on around them. Rougher hands must be called upon to continue and complete the works; but he trusted that none of them would be less sincere and anxious to do their parts—thereby ensuring an undertaking which was calculated to be of lasting benefit to the community within the Commission area, and which, he might incidentally remark, covered an area of some 55 square miles.

Bailie MacKie, of Leith, proposed a vote of thanks to the Lord Provost for presiding.

The company were entertained to light refreshments in a *marquee* on the ground, and afterwards returned to Edinburgh by special train from Granton. The weather was sunny and pleasant throughout.

THE LEAMINGTON CORPORATION AND THE GAS-WORKS.

Decision to Purchase.

A Special Meeting of the Leamington Town Council was held on Monday last week to consider (1) a proposal to rescind a resolution passed by the Council on Sept. 13, 1897, relating to the purchase by the Corporation of the Leamington Priors Gas-Works; and (2) the following proposition: "That, in accordance with the powers conferred by the Leamington Corporation Act, 1896, this Corporation, under their seal, do require the Leamington Priors Gas Company to sell their undertaking, property, rights, powers, and privileges, to the Leamington Corporation, as provided by the said 1896 Act."

The Mayor (Mr. Gordon Bland) presided; and, in opening the proceedings, he said the whole discussion would be taken upon the first proposition.

Alderman Wackrill then moved the first resolution. He remarked that it had been said that there was nothing new to warrant a change of opinion; but he maintained that there was great deal that was new. It was a most important question for the ratepayers and gas consumers of Leamington that they should use this last opportunity of considering it. He would remind the Council, in the first place, of the origin of the permission to buy the gas-works. In 1895 and 1896 a Parliamentary Bill Committee was appointed, who unanimously approved of the proposed Bill, which was recommended to the Council for adoption. It was passed by them; and in due course application was made to Parliament for an Act, which received the Royal Assent on July 20, 1896, and came into force on the 1st of November of that year. Among other important matters, the Corporation obtained powers to purchase the Leamington Priors Gas-Works; and therefore, so far, all costs relating thereto had been incurred and paid, and would not be imposed again unless they failed to take advantage of the Act on or before the 31st of the present month. The terms for negotiating the purchase were most equitably arranged in the Act. About two years ago, a similar proposition was made to the Council; but an amendment against the purchase was carried under, as he believed, some misapprehension. At that time, the Corporation employed Mr. Thomas Newbigging to make a report upon the undertaking on their behalf. It was presented to the Corporation; but some of the practical thinkers did not appear to understand it. Being a commercial undertaking, he suggested that it was too hastily passed over. Other places were deriving great benefit from the possession of the gas-works; and why should they shut themselves out at Leamington? Having cited several towns in which the rates had been reduced from the profits realized, he pointed out that 212 local authorities had purchased gas undertakings, of which number only five appeared to have been worked at a loss according to the last annual returns. The balance-sheet of the Gas Company for the year ending June 30 last in no marked degree disturbed Mr. Newbigging's report made on June 26, 1897, except in one respect. It showed that the consumption of gas was larger last year and the profit thereon greater, which, of course, might be regarded as eminently satisfactory. This was one of the new features which Mr. Newbigging said must appear; and it had done so. He told them in his report that the area of the site was sufficiently ample to allow of a much larger production, and that generally the buildings were in good condition, most of them being comparatively new, with the exception of the retort-house. But he also reported that the retorts would be sufficient for ten or twelve years to come. He said that a new retort-house would cost £10,000, and that it could be erected on the same area; that the productive power would be greatly increased, and that the saving effected would repay the outlay; that the net producing power of the present retorts was 1,160,000 cubic feet per day of 24 hours (equal to 16½ per cent. above the maximum daily production of the previous winter); that for the five years 1892 to 1896 the aggregate net profits were £973 short of paying interest on loans and maximum dividends; and that, having a reserve fund of £8729 for equalizing dividends, the balance required had been taken therefrom instead of

increasing the price of gas. He calculated the maintainable profit at £4290, which, at 28 years' purchase, produced £120,120. With other additions, including £2662 for working capital, and the expense of carrying out the purchase, the total was brought up to £127,000. The Corporation would be able at once to pay their way out of revenue, besides reaping the benefit of the increase of profits due to the future development of the undertaking, for which there was ample room; only about half of the population being supplied with gas. With a little persistent effort, and the introduction of prepayment meters, it would be possible to secure most of the other half; and much more might be done in setting forth the advantages of gas for cooking, heating, industrial, and power purposes. It should be borne in mind that the gas undertaking was a going concern. It was a totally different thing from the electric light, which, while it had not much of the "going concern" in it, had no doubt prevented the proposal for the purchase of the gas-works from being carried on the previous occasion. There were 4¼ acres of freehold land abutting on the canal; valuable plant in full working order; 36 miles of mains; the demand for gas was increasing, together with the profits; and, as he had already said, about half of the householders had not yet been supplied with gas. In the Gas Company they had honourable men to deal with—men who had an interest in the welfare of Leamington. If the ratepayers neglected this opportunity of acquiring the gas-works, they would never again have the chance, or be able to obtain the terms laid down in the Corporation Act. He concluded by expressing the hope that they would avail themselves of this opportunity.

Mr. Fell, in seconding the motion, expressed the opinion that a mistake had been made in not adopting the proposal to purchase two years ago. They would now have to pay more for the works; but they were able to borrow at a greatly decreased rate. If they paid the maximum price—£127,000—the interest would be less than £4000; and he had no hesitation in saying that the profits would be largely increased by the abolition of Directors' fees and abandoning the payment of the cost of extensions out of revenue. He hoped the Council would decide to purchase the works, and so add one more to their municipal undertakings.

Alderman Bright was sorry he could not look at the question from the same point of view as Alderman Wackrill. They had been told that there was no goodwill attached to the purchase of the gas-works. But the capital of the Company was £60,000, and Mr. Newbigging proposed £127,000 as the price; so that it looked as if £67,000 was for goodwill. If it was not, he (Alderman Bright) did not understand business. According to Mr. Newbigging's report, for five years the aggregate net profits were £973 short of the sum needed to pay the interest on loans and the maximum dividends; but the Company had been enabled to pay these from their invested reserve fund of £8729. Mr. Newbigging said the retort-house was the least satisfactory part of the concern; and considerable reconstruction would have to be undertaken to put the producing plant in a state of efficiency. With regard to the mains and service-pipes, he had been unable to examine them; but enlargement was required in certain cases. So that, in addition to the £127,000, the Corporation would have to spend £10,000 for new retorts and an indefinite sum on new mains. He argued that, taking Mr. Newbigging's statements, they had only £58 balance, supposing everything went on as expected. The reason why the electric light had not affected the Gas Company more than it had done was the exorbitant price charged for current, which made it absolutely exclusive. He intended to do without the electric light, and put on the incandescent system of gas lighting, the adoption of which would, in his opinion, reduce the gas consumption by one-half. There was another matter which everybody did not think of, and that was the price of coal. It was admitted that the coal of this country would be absolutely exhausted in 200 years, and the thick coal would be gone in 30 years, so that the price of coal and gas would be raised. When he was before the House giving evidence in the matter of obtaining an Act to enable them to borrow more money, he said without hesitation that they should buy the gas-works. Then the capital was £40,000, and the £20 shares were £22. Now the capital was £60,000, and the shares were £42. The price had dropped from £45 to £42 lately. He thought Leamington was quite sufficiently burdened already without having the gas undertaking. It was estimated that the Company were going to take £120,000 for their property; but he had it on good authority that they would not take less than £180,000. If the gas supplied to the town was sold at an exorbitant price, there would be some reason for the purchase; but under the present circumstances he saw no advantage in it at all. On the contrary, he saw great reason against it; and he hoped the Council would do what they did before, and reject the proposition.

Mr. Barrett said there was no possible reason why the ratepayers or the Council should buy the gas-works for the benefit of those burning gas and not consider those who were not doing so. Neither of the gentlemen who had spoken on behalf of the purchase had allowed that it was possible that they could buy the gas-works at the price Mr. Newbigging mentioned or at that which the Company asked. It would be determined by arbitration. Therefore the figure of £180,000 should not enter into consideration. If they purchased the gas-works for Leamington, the same thing would doubtless follow which had taken place in every town enumerated by Alderman Wackrill. He (Mr. Barrett), on a previous occasion, gave opinions and statements from other towns; and in many cases they were entirely different from those collected by Alderman Wackrill. He gave many which tended in the same direction, because there was not a single town from which they received a reply where the price of gas was not reduced or something was being paid to relieve the rates. Universally, where corporations had taken over gas-works, it had been to the benefit of the ratepayers; and in one place even 1s. in the pound had been paid towards the rates. This told very materially against the statements put forward by Alderman Bright. To have something like £5000 or £6000 a year towards paying the rates would be a glorious thing for Leamington; and they did not merely think of themselves, but of those who came after them. It was desirable that they should go forward, and endeavour to find terms on which the purchase could be made. If they voted for the proposition, they would never regret it; and if they did not vote for it, they would regret it all their days.

Mr. Heath Stubbs said he had not the least objection to the first part of the motion before them—viz., to rescind a resolution which he thought was a very injudicious one; but when they came to the second part, he should want the opinion of a skilled person, whose advice would be worth going upon, before he voted for the purchase of the gas-works under the compulsory clause of the Act under which they would have to buy. Mr. Newbigging said that if they purchased at £127,000 they would do right; but did anyone think they would purchase at £127,000 if they went to arbitration? Where a man's property was taken compulsorily, the price was not based on what it was worth in his hands; he was always allowed something for having it taken away against his will. The market price of the Company's £20 shares they were told was £42; and the £7 shares he supposed were at something about the same ratio. According to his calculation, the value of the concern upon this basis was something approaching £150,000. He did not think they should rush the matter at one meeting. They ought to have had six months to consider it. He was not in favour of buying the works unless he had some idea of what they would have to pay; and he was of opinion the second part of the proposition should be referred to the General Purposes Committee.

Mr. Hickman said he had voted against the purchase on the previous occasion, but had since rather altered his opinion, and now considered that if the gas-works could be obtained for anything like a fair figure, the town ought to acquire them.

Alderman Harvey supported the proposition. He said he was strongly of opinion that the purchase of the gas-works would prove to be a very valuable investment, and that in the long run it would be the means of greatly reducing the rates of the borough. He was strongly in favour of the penny-in-the-slot system of gas supply. He had seen it at work in the Potteries, where it had been adopted to a very large extent; and the number of consumers had increased very largely. No doubt the same result would follow in Leamington.

Alderman Gilbert agreed with Mr. Heath Stubbs that they might rescind the former resolution, but that they should not pass the second one without further consideration.

Mr. Reeve asked, if they voted that day for purchase, whether the question would come before the Council on a future occasion.

The Town Clerk (Mr. H. C. Passman) replied that, if the second resolution were passed, and the document was sealed, they would have to go on.

Mr. Richards, as one of the minority who voted for purchase on the previous occasion, was prepared to vote the same way now. He could not see why Leamington should be an exception to almost all other towns which owned their gas-works. It appeared to him that the undertaking was an assured success. They could not possibly go wrong unless they paid an outrageous price for the works; and he did not see how they could be led to do that.

The Mayor said he supported the purchase proposal on the former occasion, and should do so again very heartily.

Alderman Wackrill, in reply, said Alderman Bright had spoken of the recent improvements in gas lighting as if they were a discouragement to the owners of gas-works. As a matter of fact, they were altogether in their favour. If the illuminant were improved, everyone would take it, and the returns would consequently be larger. Alderman Bright also said that the Company intended to ask £180,000 for their undertaking. They were not dependent on that. What they were dependent on was the valuation laid down in the Act, which had nothing to do with prospective profits, but was entirely retrospective. Mr. Heath Stubbs talked about getting the opinion of a skilled man; but where could they get a better man than Mr. Newbigging? As to the competition of electricity, he maintained that at present it could not be depended upon for lighting purposes. Gas was still the most reliable illuminant. The consumption of gas was increasing in spite of all that electricity could do. Since January, 1897, twelve corporations had acquired gas-works; and the profit in five of the smaller ones had been as follows: Dunfermline, £2939; Matlock Bath, £719; Chesterfield, £1027; Cowes, £591; and Malvern, £2919. During the last ten years there had been 96 new gas undertakings started, of which 52 were owned by companies and 44 by local authorities; bringing the gross total to 748. He sincerely recommended the Council to vote for the proposition, feeling certain that they would never regret it—their only regret would be that they did not do it two years ago.

On a show of hands, the first resolution was carried by an overwhelming majority.

Alderman Wackrill having moved the second resolution,

Mr. Heath Stubbs moved, as an amendment, that it be referred to the General Purposes Committee, in order that the Council might be advised.

Mr. Barrett remarked that to adjourn the question for the purpose of which Mr. Heath Stubbs had spoken would be almost an absurdity, because they had already obtained the opinion of the very best man available. He seconded the resolution.

Mr. Jeaffreson could not understand, after such an overwhelming expression of opinion in favour of the proposition, why the small minority could not see their way to abandon the attempt to obstruct the scheme, and give it their straightforward support.

The amendment was defeated—only four voting for it; and the original resolution was carried by 13 votes to 2.

On the motion of Alderman Wackrill, the borough seal was fixed to the necessary document; and the proceedings closed.

The Chester Rural District Council have agreed to apply to the Local Government Board for power to borrow £7820 to carry out a scheme for the drainage of Great Boughton. It is proposed that there shall be an outfall at the Huntington Brook, which discharges into the River Dee at a point below the Chester Water Company's intake. The Company, it is understood, will offer strenuous opposition to the scheme.

The Trade Union Congress, when it meets next year at Huddersfield, is likely to be somewhat differently constituted from what it has been of late years. On Thursday week, the Parliamentary Committee decided to formulate a scheme for altering the Standing Orders of the Congress. The alteration proposed is with a view to meeting criticisms such as those of Mr. T. Burt, M.P., who recently declared that the Congress was not to-day an efficient machine for the purposes for which it was formed. The scheme of reconstitution will be settled in detail during the next few months; and by the end of February, it is hoped that it will be in the hands of the Unions represented at the Plymouth Congress, so that time may be given for the discussion of the scheme before the Congress meets next year.

PROFIT-SHARING, AND THE RELATION OF COPARTNERY TO TRADE UNIONISM.

There seems to have been a good discussion on the paper which Mr. George Livesey read at the co-operative production and co-partnership conference at Newcastle last Saturday week. The subject was the profit-sharing scheme of the South Metropolitan Gas Company; and the portions of the communication in which the general results of the adoption of the scheme were recorded were given in the "JOURNAL" last Tuesday. Several speakers, who were well qualified to do so, took part in the discussion, which followed the lines indicated below.

Sir B. C. Browne, in opening, said there was plenty of room for all to be well off; and they must do it one at a time, bringing up a few men, as Mr. Livesey had done at the gas-works, and as others had done in the same way. Most of the difficulties, he believed, were imaginary. He was inclined rather to prefer that the joining of the men should be voluntary, and not compulsory. It would be a great gain if even more men were shareholders. Mr. Hugh Boyle (Northumberland Miners' Association) was delighted with Mr. Livesey's paper, which pointed in the direction of a success. He could not understand how any trades unionist could object to the principle. If workmen could not be in the position to finance and manage the concerns, the best thing that could be done was to accept partnership with those who possessed the capital, and also to accept the management of those who were able to manage and act in unison for the welfare of all. Mr. Austin (one of the Workmen Directors of the South Metropolitan Gas Company) testified to the excellence and benefit of the profit-sharing scheme. It did not displace labour; it educated and increased and improved labour, from the stoker to the collector and the meter-taker. Mr. W. Crookes (Blaydon) said they prided themselves in the north on the success of co-operation; but as yet they had done very little as regarded the success of co-partnership. Surely they should be able to do something in this direction in the north. Co-operators ought to show the lead. Mr. George Livingstone (a stoker in the employ of the Newcastle and Gateshead Gas Company) remarked that he had been a firm believer in Mr. Livesey's scheme since it was initiated. He would like to ask why the scheme had not been adopted in Newcastle. Mr. Butcher (the other Workman Director of the South Metropolitan Gas Company) said that, with profit-sharing and co-partnership, he felt that they wanted no other union, because they were secured for the future. Mr. Alexander Wilkie (of the Shipwrights' Society) controverted the statement of Mr. Butcher as to there being no need for any other union. They could take up the question as organized workers, and not in the slightest entrench upon their position as trades unionists. The Lord Bishop of Newcastle said the more people there were with a stake in the country, the better. In a purely agricultural country, this meant land-owning. Happily, they had also commercial enterprises; and these commercial enterprises, with all the plant they involved, gave a very great advantage in having a very much larger number of people with a stake in the country than was the case in a purely agricultural country. In these enterprises, capital, brains, and labour were necessary; and any scheme which tended to unite these, was obviously good, and needed only to be worked out in detail. Others who took part in the discussion were Mr. John Wilson, M.P., Mr. G. B. Hunter (a leading Tyneside shipbuilder, who said his firm were going to try to introduce the scheme), and Mr. Vivian. On the motion of the Dean of Durham, Mr. Livesey was heartily thanked for his paper.

Following the above discussion was a paper by the Rev. Canon Moore Ede, Rector of Gateshead, on a kindred subject. It was entitled—"Co-Partnership, and its Relation to Trade Unions." The author held that trade unions had done much in the way of educating men for co-partnership; and, as co-partnership carried on the democratization of industry further than it was possible for unionism to do, trade unions should look sympathetically on co-partnership, and hold it before their members as an ideal which they should strive to realize. Co-partnership, however, would not supersede all the functions of unionism even in those fields of industry which it succeeded in occupying; and there were many which it would not occupy for some years. And in those departments of industry, the democratization of industry must be sought in some other way—sometimes through control by the municipality, as in the case of gas and water, and sometimes, as in the case of education and railways, by the control of the nation. In such cases, the work of trades unions would tend more and more to make trades unions bodies to supply expert knowledge of proposed changes. In other cases where the magnitude of the capital was large in proportion to the number of persons engaged in an industry, effort must be directed to obtaining some partial share in the business, and representation on the management, somewhat on the lines of Mr. Livesey's remarkable and successful experiment. It was right that man should control capital; not that capital should control man.

In the discussion, Mr. F. Maddison, M.P., said that he thought trade unionists should do more than view co-partnership sympathetically. If the trade unionists of this country knew their business, they would take hold of the instrument which was ready to their hands. There could be no fear of loss; for to begin with they were assured that the minimum would be the standard wage of any particular district. Hitherto trade unionists, for the reason that they had always been in the fighting line, had not had a fair opportunity of looking at economic questions. Co-partnership had nothing to say against machinery. He believed that everything that lightened work, increased the output, and went to create wealth, was good, and must not be hindered. The very breath of co-partnership was labour—the labour of hand and brain—as the great wealth creator. Was there or was there not a way in which equity could be secured without in any way detracting from the sum-total of wealth? Sir Benjamin Browne, Mr. J. N. Bell, Mr. Hugh Boyle, Mr. John Whitburn, Mr. W. Flynn, Mr. Holliday, and others also took part in the discussion, which Earl Grey concluded by saying that he had been struck by the absence of hostile criticism of the principles of co-partnership which the members of the Labour Association had attempted to put before the conference. It had been admitted on all hands that, if the principle could be successfully applied, it would improve the position all round, would bring employer and employed closer together, and provide an impulse which would let loose all sorts of forces which were now lying dormant—forces which would lead a man to take greater interest in his work, and which would familiarize him with the responsibilities and risks of the business of the world. It was a hopeful and regenerating principle. They hoped soon to see it more generally applied to the industries of the North of England; and they had reason to believe that it would soon be so applied after having heard the sympathetic speeches of influential employers of labour. He suggested that a very good start might be made by co-operators voting at their next quarterly meeting for the application of the system to the employees of the co-operative stores.

ASSOCIATION OF MUNICIPAL CORPORATIONS.

The Autumn Meeting of the above-named Association was held at the Westminster Palace Hotel last Wednesday—Sir JAMES WOODHOUSE, M.P., presiding, in the absence, through illness, of Sir Albert Rollit. There was a large attendance.

The LORD MAYOR OF MANCHESTER (the Right Hon. W. H. Vaudrey) moved—"That this Association affirms the principle that where local authorities have, with the sanction of Parliament, established, or are in course of establishing, undertakings for public benefit, and have not failed in the performance of their duties, it is not right or expedient that any similar powers should be granted to companies within the areas of such local authorities; that this resolution be referred to the Council, in order that they may organize an opposition at any stage to any Bill which may be promoted in Parliament the provisions of which are in contravention of the principles set forth in this resolution." He said he had been asked to move this resolution because of the interest the city over which he presided had taken in three special Bills promoted last session—the General Power Distributing Company Bill, the Lancashire Electric Power Bill, and the South Lancashire and Cheshire Electricity Company Bill. A number of the Mayors of Lancashire had a meeting, and unanimously determined to oppose the first two Bills. When a corporation, with the sanction of the Local Government Board, spent large sums of money on gas, water, or electric light works, the money was invested for the benefit of the ratepayers of the district. Corporations gave to the ratepayers in their individual districts the best possible results at the least possible cost. In these circumstances, it seemed to him to be absolutely impossible for a limited liability company to compete with a local authority on any terms under which the ratepayers would derive benefit from the competition. They should, therefore, do all they could to oppose the Electric Power Bills, which could in no way benefit the ratepayers of the large cities and towns of England.

The motion having been seconded, an opinion was expressed that it did not go far enough.

The MAYOR OF NOTTINGHAM (Alderman E. H. Fraser) said the crusade which had been commenced against what was very improperly termed municipal trading was the direct outcome of the victory the corporations scored in the House of Commons. So far as they had embarked in municipal trading, they had done so under the direct sanction and authority of Parliament; and therefore their action in the past, in what they had done in the various departments of municipal administration, could not now be challenged. If it was challenged, he should like to know in whose interest this would be done. The management by corporations had been pure; but could the same always be said of local companies? If it was asserted that corporation management in these matters was not always profitable, he replied that statistics were a sufficient answer. As to the question whether in the future they ought not, in some way or other, to define how far municipal trading was to go, very great and grave danger lurked in the proposal, for it meant the restriction of the free action of corporations. They ought to be left at liberty to undertake those matters which from time to time Parliament sanctioned.

The CHAIRMAN thought that in the next session there would be a still more determined attempt on the part of companies to compete with local authorities; and therefore they should be united on the subject.

It was decided to add to the motion the words, "or which otherwise interferes with the interests, rights, and powers of municipal corporations;" and in the extended form it was carried unanimously.

Alderman GREEN (Nottingham) then moved—"That this Association authorize the Council to appoint a Committee to meet the Committee appointed by the County Councils Association to consider what steps can be taken with respect to the present condition of the law as affecting sources of water which are, or may become, necessary for local consumption, and the advisability of conferring powers upon local authorities in regard thereto." He said he was sure all representatives present felt the absolute necessity of safeguarding the present sources of supply, and taking care that there should be no waste of water. The law as it stood was quite ineffective for this purpose. Property-owners often complained that they could not do what they pleased with their own; and he thought that, as far as their surface operations went, they were subject to a great number of restrictions for the benefit of the locality. As soon, however, as they got out of sight, under ground, they could do many things without restriction which were very detrimental and damaging to the community. They might allow millions of gallons of water to run to waste, or they might dispose of it to some water company, and so deprive the locality of the water needed.

The motion was carried.

The TOWN CLERK OF LONGTON (Mr. G. C. Kent) next moved—"That the Bill on the subject of Borough Funds, as it passed the House of Lords last session, be introduced in the House of Commons next session; and that the Secretary be requested to communicate with the Home Secretary with a view to the Government taking up or supporting the Bill."

Sir T. HUGHES seconded the motion.

The CHAIRMAN said that during the past session, when the London Local Government Bill was under consideration, the attention of the House of Commons was drawn to the proposed re-enactment, with respect to that Bill, of the old clauses of the Borough Funds Act; and it was pointed out to the Government how badly that Act worked, and how already the House of Lords had recognized it, and passed a measure to amend it. Mr. Balfour, who was in charge of the Local Government Bill, thought it was a subject which demanded consideration; and he gave an intimation that it should receive attention at the hands of the Government. He thought, therefore, the Association would be wise in

pressing the Home Secretary to give his support to a Bill which in some shape would remove the anomalies in the law which at present existed.

The motion was unanimously agreed to.

The Town Clerk of Dover (Mr. E. W. N. Knocker) called attention to the cost of promoting Local Improvement Bills in Parliament, and moved—"That, in the opinion of this Association the cost and inconvenience incurred in the promotion of Local Improvement Bills in Parliament should be lessened; and that it be referred to the Law Committee to consider the best methods of giving effect to this resolution, with instructions to report to the Council, who are authorized to take such steps thereon as they may deem advisable."

The motion having been seconded,

Alderman Birt (Richmond) said it was very unjust that municipal corporations should be in the position of having to go through the formality of obtaining an Act of Parliament for a very small improvement. The principle should be established that when a public body required land for a public improvement, it ought, almost as a matter of course, to be given on payment of compensation.

The Chairman said the question raised was a grievance about which they had all been complaining for many years; and Parliament had recognized during the past session that it was one which ought to be redressed. It was a reform for which they must continue to press.

The motion was unanimously agreed to; and the business closed.

LEEK DISTRICT COUNCIL GAS-WORKS.

A Scheme of Extension and Modernization.

In last week's issue, it was stated that a meeting of the Leek District Council had been held for the purpose of considering a proposed expenditure of about £22,000 in extending and modernizing the gas-works plant. The Gas Committee (who had been advised by Mr. Thomas Newbigging) recommended that the tenders of Messrs. W. J. Jenkins and Co., Limited, be accepted for Sections 1 and 2, and that of Messrs. C. & W. Walker, Limited, for Section 3. The contract for a conveyor has been reserved until certain outside arrangements can be made. The grounds on which the Committee based their justification for recommending such a large scheme were succinctly stated by Mr. T. H. Booth, the Chairman.

Mr. Booth, in moving the adoption of the Committee's minutes, said he had been asked by the Council in Committee to report what the growth in the demand for gas was likely to be in the next twenty years, judging from the past; also how the annual payments of interest and principal on the large outlay proposed, would be met. They had accurate and precise data to go upon in the past; but with regard to the future—taking into consideration the possible introduction of the electric light and the new system of carbonizing—it would necessarily be in the nature of an estimate. But even in this they had something to guide them, in the results obtainable from other towns under similar circumstances. As to the probable requirements for the manufacture of gas during the twenty years, he found that the quantity produced in 1888 was 47,387,000 cubic feet, in 1894 60,105,000 cubic feet, and in 1898 71,373,000 cubic feet; being an increase in the ten years of 50·62 per cent., or 5·06 per annum. The greatest make in 1898 was 422,000 cubic feet in the 24 hours, which would be increased to 633,000 cubic feet in ten years, and to 999,500 cubic feet in twenty years; thus almost exactly coinciding with what they set out to provide for—viz., a million cubic feet per day. The provision for the next twenty years referred only to Section 2, which included condensers, scrubbers, exhausters, purifiers, and connections. Probably, in the course of some years, another holder would be required and the retorts extended. From the experience of other towns where the electric light had been introduced, it had not seemed to interfere with the growth of the demand for gas. According to the tenders sent in, the two selected by Mr. Newbigging, and recommended by the Committee for the Council to accept, would amount to £20,431, which included a conveyor across the Newcastle Road from the railway siding. With fees, clerk of works, and possible extras, the total would come to (say) £21,000, on which, if borrowed for thirty years at 3½ per cent., the interest and repayment of principal would be about £1088 10s. To meet this large annual sum, it was estimated that Section 1—the carbonizing department—would effect a saving as follows: The wages paid for carbonizing 7157 tons of coal, &c., in the year 1898 was £780, or a little over 2s. 2d. per ton. It was estimated that, under the new system, it would cost £485, or 1s. 4½d. per ton—saving £295, or a little above 9¾d. per ton. It was calculated that the saving in coke for firing would be about 2 cwt. to the ton of coal carbonized, which would represent 715 tons. This at 8s. 4d. per ton—the present price charged to ratepayers—would amount to £298. Another saving would be the extra gas made, which would be equal to 300 cubic feet per ton of coal carbonized, at 2s. 3d. per 1000 cubic feet, £240. The additional production would be obtained owing to the higher heats and quicker charging of the retorts. Another saving would be in conveying the coal from the railway siding. The cost in 1898 was £153 for carting, for storing £50, and for siding £10—making £213. Under the conveyor system, it was estimated that the interest and repayment on the cost of the conveyor (£840) would be £42, wear and tear £20, man (part time) £26—total £88, or a saving of £125 per annum. There was also an estimated saving in purification of £50. The total savings would then be as follows: On the carbonizing department £295, on coke used for firing £298, on extra gas for sale £240, on the conveyance of coal £125, and on purification £50—a total of £1008. From this they deducted cost of gas for engines £58, and contingencies £50—leaving £900. These figures were considered to be well under the mark. They were also based on 1898; and with the increase in the make of gas, the cost of working would be proportionately less. The estimates referred solely to the working of the plant, and took no account of the rise and fall in the price of coal. It was confidently expected that nothing would be added to the rates on account of this outlay; but on the contrary—when the new plant got into working order—the department would be able to contribute still more to the lowering of the rates. The Council would then have the satisfaction of knowing that the town would possess a well-equipped, up-to-date works, second to none in the country of the same size.

The minutes were discussed at great length. Messrs. Ingham, Heath, Mason, and Bishton considered that the resolution should be referred back; it being contended that such a sum as £22,000 should not be spent in a hurry. It was doubted whether the expenditure of the money would prove as profitable as stated by Mr. Booth; one or two of the councillors even venturing the opinion that the scheme would result in a fourpenny rate. The great increase in the price of coal this year, and no doubt next year, would, in the opinion of those opposed to the scheme, interfere with the results as expected from the figures. On the other hand, the members of the Committee urged that the resolution should be adopted at once, as the gas-works were sadly overburdened, and with the present plant and appliances, they could not properly turn out the quantity of gas required.

Ultimately the resolution of the Committee was adopted by 13 votes; but it is understood that notice to rescind the resolution has been given.

ELECTRIC LIGHTING NOTES.

The Elland District Council last Friday considered the question of adopting a scheme of electric lighting, and resolved to apply to the Board of Trade for the necessary powers.

The Paignton District Council have decided to apply for a Provisional Order for the supply of electric light. Like many of the local authorities in South Devon, they have been forced to take action in order to keep out a threatening company.

The Board of Trade have drawn the attention of the Yeadon District Council to the fact that they have taken no steps to carry out their obligations under the Electric Lighting Order granted to them in 1894. The Council are now getting expert advice on the subject.

Electricity is said to be in increasing demand for lighting purposes in Exeter. There are, however, still numerous complaints of failure, and of the dull appearance of the streets because the arc lamps do not give light at times. An explanation is that the present plant is being overworked.

Professor Fleming has presented a further report to the Douglas Corporation on the subject of electric lighting. He was asked to report specially as to whether the town should have its own installation, or take the supply from the Electric Tramway and Power Company, who offered favourable terms; and he advised the Corporation for general reasons to lay down their own installation, as well as on the ground that no financial saving would be effected by the other plan. The Lighting Committee recommend the adoption of the report.

Something astonishingly out of the usual order of things has happened at Wrexham. In the course of an inquiry last Friday by Mr. H. H. Law respecting an application by the Town Council for the sanction of the Local Government Board to the borrowing of £20,000 for electric lighting purposes and £2100 for a refuse destructor, the Town Clerk (Mr. Thomas Bury) said the Corporation had no complaints to make against the Gas Company; they gave them gas considerably over the prescribed illuminating power. Happy Gas Company; honest Corporation!

The proposal of the Redruth District Council to erect electric lighting works was rejected by a meeting of the ratepayers last Thursday. Mr. W. H. Trentham, who was consulted by the Council, strongly recommended them to embark on the scheme. He estimated the cost at £12,364; and the returns should, he said, be sufficiently substantial to place the undertaking on a profitable basis at the end of the second year. The meeting was pretty evenly divided in opinion; and it was only on a second vote being taken that the majority was found to be against a public scheme.

The powers of the Harrow Electric Light Company only apply to the old Local Board area; and they are possessed by a sudden desire to extend their arms over the whole district. To do this, they, of course, need a new Provisional Order, for which notice must be given in July. So eager are they to spread outwards, that they cannot wait until next July; and therefore they have asked the District Council to aid them in circumventing the Act by applying for an Order on their behalf. This the Council have consented to do, on condition that they are indemnified against all costs in making the application.

Complaint is made in the newspapers as to the uncertainty of electric arc lamps for street lighting at Plymouth. By constant attention to particular lamps, the staff of the Lighting Department manage to keep things going pretty fairly until about eleven o'clock. Then they go off duty, and alternate lamps are extinguished for the sake of economy. It frequently happens that many of the lamps left on go out, and the main streets are in comparative darkness. On a recent morning, only one lamp was alight in one of the main thoroughfares. Curiously enough, it was immediately opposite the offices of the Gas Company.

Apropos of the approaching introduction of electric light into Lowestoft, for which a loan of £30,000 has been obtained, and for which the necessary works are now in progress, some interesting figures have (says a Suffolk contemporary) been published, showing that the cost of gas for an incandescent burner for 1500 hours' light of 60-candle power, at 4s. per 1000 feet (the cost of gas in Lowestoft), is £1 1s.; while for 1500 hours of electric light at 50 candles the cost would be £3 10s. 6d., or more than thrice as much. This looks as if the electric light will be an expensive luxury, and that the rates are likely to be considerably increased.

Another mishap occurred in connection with the Manchester electricity system last Wednesday morning. There was an explosion at the corner of Market Street and High Street; and a large flag was lifted several feet—two foot passengers being thrown down, and somewhat severely shaken. The accident was due to a fault in the electric cable, and was of a similar nature to others which have recently occurred in various parts of the city. The cable is one of the old ones, which are being replaced by the Corporation by others of a more efficient type; but there are still some 20 miles to be dealt with before the task is completed.

The Salford Corporation propose to provide an electricity generating station at Pendleton. Sanction has already been obtained to the loan of money for the purchase of the site; and the Corporation have applied for permission to borrow £10,000 for the provision of the necessary buildings and plant. An inquiry into the application has been held by Mr. G. W. Williams, an Inspector of the Local Government Board. Mr. L. Caradoc Evans, Acting Town Clerk, said a great demand for electric light existed in the borough; and the present application was especially urgent, as

electric power would soon be required for tramways. The Corporation would shortly ask permission to borrow a further £72,000 for the electric lighting scheme.

That one of the vagaries of the electric light is its failure at the most inopportune moment, has been pretty generally admitted ever since the introduction of this fickle illuminant. On the night of Sunday, the 15th inst., an accident occurred to the electric light plant in Scotch Street, Carlisle, which caused the whole of the arc and incandescent lamps supplied from the Corporation works to go out. The accident took place at five minutes to eight o'clock, when an explosion occurred at the cable junction at the corner of the above-named street and East Tower Street. The cover of the box was blown out of its place, and a huge flame burst out of the hole for a few minutes, rising to a considerable height. This being followed by the sudden extinction of the street lamps, caused some commotion in the streets; but the moon was shining brightly. About an hour after the accident, the gas-lamps were lighted. The congregation at the Presbyterian Church, Fisher Street, had a brief experience of the inconvenience caused by the failure of the electric light. The service was nearly over, and the Evening Hymn was being sung. It is reported that when the congregation reached the line, "For all the blessings of the light," the electric light suddenly collapsed, and for a few moments there was total darkness. Some few years ago, we believe a similar mishap occurred in a church during the singing of Newman's beautiful translation of "Lux benigna"—Lead, kindly light.

The Maidstone Town Council have formally agreed to apply to the Local Government Board for sanction to the borrowing of £30,000 for carrying out a combined electric lighting and dust destruction scheme. The plant is estimated to cost £17,300, an extra dynamo £2000, destructor plant £2400, and buildings £6000. Engineers' commission and contingencies will make up the sum to be applied for. A public meeting, called by the Maidstone Ratepayers' Association for the purpose of making the inhabitants of the town acquainted with the advantages and disadvantages of electric light, in view of the proposal of the Town Council, was held at the Town Hall on Monday evening last week—Mr. J. Waghorn, President of the Association, in the chair. The Association had invited Mr. Horace Boot, Electrical Engineer to the Tunbridge Wells Corporation, to address the meeting. He expressed the opinion that Tunbridge Wells was lighted 25 times as well as it was by gas, at an outlay of only £742 more. With regard to cost there were many arguments; but roughly it might be said that gas at 3s. per 1000 cubic feet was equal to electric light at 6d. per unit. At Tunbridge Wells they charged 4d. per unit. If the light was decided upon for Maidstone, it would be the duty of every ratepayer to help to make it a success, chiefly by becoming a consumer; and, moreover, they must have an engineer who would enter heartily into the spirit of the undertaking. Three questions were put to Mr. Boot before the meeting closed. The first, as to whether the ratepayers could rely on the statement that gas at 3s. per 1000 feet was equal to 6d. a unit for the electric light, was answered in the affirmative. The second, as to what was the usual amount charged per unit, Mr. Boot answered by saying that the light was supplied, on an average, 1d. per unit cheaper by corporations than by companies. With regard to the third question, as to whether it was possible to get electric light in private houses equal to gas at the same cost, he said that in his opinion they could not compare the two.

Mr. H. Percy Boulnois conducted an inquiry at Manchester last Tuesday into an application to the Local Government Board by the City Council for sanction to borrow £22,000 for purposes of electric lighting. The Deputy Town Clerk (Mr. T. Hudson) explained that the object for which the money was required was to enable the Council to acquire an additional plot of land at the Polygon, Ardwick, on which to erect workshops, stores, and offices in connection with the Electricity Department. The cost of the land would be £2295, and of the buildings £15,000. Incidental work and fees would absorb the balance. Alderman Higginbottom, the Chairman of the Electricity Committee, gave evidence to show the commercial success of the undertaking. In the financial year ending March last, a net profit of £17,188 was made. A sum of £3344 was transferred to renewal account, and £12,000 was handed over to the city fund in aid of the rates. In March, there was a balance to renewal and suspense account of £12,794, and to the credit of the reserve fund £23,197; making a total to the credit of the Committee of £35,992. The prices charged by the Committee bore very favourable comparison with those in other cities; indeed, taking the average price upon the whole of the charges, they were the lowest in the kingdom. The Inspector congratulated the Alderman on the success of the undertaking. Mr. C. H. Wordingham, the Corporation Electrical Engineer, said the area supplied was, approximately, 16 square miles. They were under obligations very shortly to increase that to 45 square miles, roughly; and there was a likelihood that this would be considerably augmented. The extended area included not merely the city, but outside districts, such as Moss Side, Levenshulme, and Withington. Upwards of 500 men were at the present time employed by the Committee in the laying of mains and the maintenance of those already laid; and this number would have to be added to very shortly. The proposed buildings were therefore essentially necessary for the storage of cables, &c., especially as the Committee would have presently to deal with the overhead equipment of the tramway undertaking. The department had also to contemplate the question of street lighting. It had been resolved by the Council that the main roads along which the tram-rails would run should be lighted electrically by means of arc lamps placed on the posts that carried the overhead equipment; and the care and maintenance of those lamps would devolve upon the electrical staff. The Inspector paid a visit to the site of the proposed works.

LIVERPOOL CORPORATION WATER UNDERTAKING.

Extending Business and Increased Consumption; Purity of the Supply.

The Chairman of the Water Committee of the Liverpool Corporation (Alderman Radcliffe) had an interesting statement to lay before his colleagues on Tuesday last regarding the operations of the department during the twelve months ending Sept. 30. He said that the number of new tenants supplied with water in the year was 3384; and the total number of water tenants within the compulsory limits of supply was now 168,348. The quantity of water delivered in the year was 9,564,514,000 gallons—an increase of 650,510,000 gallons over the amount supplied in the preceding year. The quantity of water sold by meter for trade purposes in the city and suburbs (included in the above figures) was 2,245,000,000 gallons; being an increase of 92,930,000 gallons. The total quantity of water supplied to shipping was 124,344,900 gallons—an increase of 13,828,700 gallons. The quantity sold in bulk by meter along the lines of the Rivington and Vyrnwy aqueducts was 445,000,000 gallons, against 405,000,000, or an increase of 40,000,000 gallons. The total length of new mains and distributing-pipes laid in and around the city during the year was 13 miles. The stoning work completed within the twelvemonth for the protection of the slopes at Lake Vyrnwy was about 1550 lineal yards; and 14 pipe-cleaning chambers were constructed on the Vyrnwy aqueduct. At the Conway tunnel, the length driven during the year was 400 ft. 6 in. at the inlet end, and 1256 feet at the outlet end—a total of 1656 ft. 6 in. The long period of dry weather experienced in the past summer caused an unusually heavy demand to be made upon the water resources of the Corporation. The demands were fully met; and an abundant and constant supply was given—not only for domestic and trade requirements, but also for all public and sanitary purposes. One important event of the year, which occupied the attention of the Committee for several months, was the purchase of the Anderton Hall Estate for the protection of the Rivington watershed. The erection of a huge hospital for pauper epileptics on the margin of the Rivington reservoir would undoubtedly have had the effect of seriously depreciating the value of these important works. Fortunately, the danger had been averted; and it was to be hoped that Liverpool would be able to maintain in the future, as in the past, the high standard of purity which characterized the Rivington water. More than a year's experience had now been had of the arrangement made with Professor Boyce for the systematic bacteriological examination of the water supply. Altogether nearly 600 separate bacteriological examinations had been made since the Professor undertook the work. These had been of considerable value in affording information not only as to the quality of the supply from day to day, but also as to the efficiency of filtration and distribution under the varying conditions that obtained in practice. It must, said the Chairman, be satisfactory to the Committee to know that the Liverpool Corporation were the first in this country to establish a systematic bacteriological examination of the water supply. The general conclusion to be deduced from the investigations was that the water delivered to the inhabitants of the city was unsurpassed in quality, and was throughout all seasons absolutely free from pathogenic germs. Professor Boyce had recently made an official visit on behalf of the Government to the principal cities on the Continent, and had instituted special inquiries in regard to the sources of water supply and the methods in operation to ensure its purity. He had found that bacteriological methods already adopted here were in general use in the leading cities of Europe; and the results obtained showed that nowhere was a higher standard attained than in Liverpool.

PROPOSED PURCHASE OF THE CAMBRIDGE WATER-WORKS BY THE CORPORATION.

The Cambridge Borough Council had a special meeting last Thursday, under the presidency of the Mayor (Alderman G. Kett), to consider the question of purchasing the water-works. The Parliamentary Committee reported that, the Council having provisionally approved of the introduction of a Bill into Parliament to enable them (among other things) to acquire the Cambridge University and Town Water-Works Company's undertaking, they had, in accordance with instructions, prepared a series of clauses with reference to the matter, for insertion in the Bill. Having set out the clauses in full, the Committee expressed the opinion that the conditions under which the acquisition of the water-works would take place would be fair and equitable to the Corporation and to the shareholders of the Company; and they therefore recommended that the general approval of the Council should be given to the scheme on the basis of the clauses submitted. Mr. Tillyard, in moving the adoption of the report, said the question was one which had been before the Council a long time, and they were now asked to take a decisive step with respect to it. He regarded the chief argument in favour of the proposal to be that of public health. As to whether or not the water-works were worth acquiring, he wished to lay a few figures before the Council. He maintained that the Corporation were seeking to acquire in the first place an expanding business. He found that, in the first half of 1897, 199 new premises were supplied with water, bringing in a rental of £214. The second half of that year showed 188 new premises and £189 rental; making a total of 387 new premises supplied during the year, bringing in a rental of £403. In 1898 the new premises for the two half years were 174 and 177; making a total of 351, which brought in an additional revenue of £321. Then in 1899 the total number of new premises was 348, and the additional revenue £406. The totals for the three years were 1080 new premises and £1130 additional income. This gave an average of 362 new premises, and an average income of about £375, every year. The total number of houses was 15,309. He thought anybody in business for himself would be very well satisfied if his receipts always showed that. All the Company's back-dividends allowed by Act of Parliament had been paid up years ago. The Company had always declared the full dividend; and, as far as he could judge, they had always earned their money easily. The cost of acquiring the undertaking was estimated at £275,000, besides an allowance for extras. If they put £5000 down for these, they would have a total of £280,000. A small sum would have to be paid in cash, and the £280,000 in 65 years, or perhaps a longer time if they could get Parliament to grant it. Alderman H. M. Taylor, in seconding the motion, said that, speaking roughly, the result was this—that if the purchase passed in accordance with the clauses, it would cost the ratepayers something like 1¼d. per annum in rates at the start. Of course, after a time, they would hope that the burden on the rates would become less, and that eventually the ratepayers would receive some advantage from the acquisition which they had made. Dr. Waraker opposed the purchase on the ground that it would probably be opposed in Parliament.

The total annual cost to the city would, he said, be £12,877. He was informed that the income of the Company was £12,083; and this left a deficit for the Corporation to pay, which, he took it, must fall upon the rates. He did not think increased rates would be a popular thing. They could hardly increase the water-rates, and they were obliged, he believed, to pay the full amount of the dividend which was now being declared. He pointed to the large expenditure to which the Council were pledged, and asked whether this was the time for launching out into a further outlay which was not necessary now, at all events. They might just as well postpone the question until they saw how they stood. After some discussion, Mr. Tillyard replied. He said the Company's business was increasing, as he had shown, at the rate of £375 per annum. It was found in most other places that in the first three or four years there had to be a rate-in-aid, which in the case of Cambridge would be ½d. in the pound; and then, after three or four years, all expenses were paid, and a profit was made. They had reason to hope that this would be the case in Cambridge. They speculated on the chance that the city would continue to grow in the same steady way that it had done in past years. If it did not do so, they would have made a bad speculation; but if it increased, they would have made a good one. The recommendation of the Committee was adopted by 26 votes to 2.

WASTE OF WATER IN THE OLDEN TIME.

The prominence which has lately been given to the subject of the waste of water, consequent upon the anxiety caused by the long-continued drought, invests with special interest the following historical particulars reproduced from the "Engineering Record." They were published as the result of the perusal of some remarks in a Boston architectural paper, in which it was pointed out that the engineers of Rome planned and built their aqueducts with the view to preventing leakage better than the men of to-day. The architectural writer said: "It is difficult to believe that the Romans—a people ingenious enough to be able to use Roman numerals in their sums of multiplication and division with the same facility that an English haberdasher now makes the correct change for you in pounds, shillings, and pence—were really so simple-minded as not to know that water would seek its own level; and really believed it was necessary to build their enormous aqueducts solely that their water might be brought to them on a level. Is it not more sensible to believe that they knew the value of water and the cost of getting it, and also knew the difficulty of preventing underground leakage, and hence so built their aqueducts that a leak could be instantly discovered and cured, and in a way that should make absolutely of no avail the wiles of the 'lowest bidder,' who counts on mud cement, thin-shelled, and air-blown pipe, and half-caulked joints? The ancient and modern aqueducts of Italy, France, and Spain are such picturesque landscape features that one cannot but regret either the advance of learning or the greater potency of the political boss, with his cohorts of swindling contractors."

The Editor of the "Engineering Record" was rather pained to read this criticism, and immediately consulted Mr. E. Wegmann, who has for many years made a speciality of the study of ancient water-works, as to its truth. According to this gentleman, there was a time when it was believed the Romans built their grand arcades because they did not know water would find its original level if carried by syphon-pipes. This is a great error. The Romans understood the principle of the inverted syphon perfectly. They applied it in distributing the water in Rome through lead pipes. In the Claudian aqueduct at Lyons, built during the first century of the Christian era, two deep valleys were crossed by syphons consisting in one case of twelve, and in the other of nine oval pipes made of sheet lead. The reason why the old Romans did not use such syphons to a greater extent was in all probability because lead was expensive and weak. When the old lead pipes had diameters of from 6 to 8 inches, they were surrounded by masonry to give them additional strength. If pipes of cast iron, wrought iron, or steel had been available, syphons would doubtless have been introduced more frequently in the aqueducts.

On most of the aqueducts settling basins (*piscinæ*) were introduced. They consisted of four chambers; two being placed above the other two. The arrangement of these *piscinæ* shows clearly that the old Romans knew water would find its own level. The water entered one of the upper chambers, and passed through a hole in its floor to the chamber below. It then flowed from the latter to the second lower chamber through small holes in the partition wall, and finally rose through a hole or pipe into the fourth. In passing through a *piscina*, the water left most of its coarse sediment in the lower chamber.

It is not likely that the aqueducts were built on arcades to facilitate the detection of leaks. Out of 262 miles of aqueduct built by 52 A.D., 223 miles were constructed below ground, and only 39 miles on arcades. Instead of stopping leaks, the *aquarii*, who had charge of the aqueducts, rather encouraged them. Frontinus, who was the Curator Aquarum, or Commissioner of Water Supply, under Nerva and Trajan, says in his well-known description of the Roman aqueducts that, according to law, the *aquarii* were allowed to sell for their own private profit all the water which leaked from the aqueducts. Under these circumstances, it is not astonishing that they were apt to encourage a leak rather than to stop it; and if there was no leak at a point where water might be sold, they were apt to start one. Besides leakage, other losses of water occurred by the unauthorized tapping of the conduits by persons through whose grounds these works had been constructed.

It is a curious fact that while the old Romans constructed such grand aqueducts, they appear to have been very negligent about maintaining them. Among the causes of the ruin of these structures, Frontinus cites the following: Poor work in the original construction, the effect of the weather, and damage caused by the roots of trees planted too near the aqueducts. Perhaps one of the principal reasons why the works were not better maintained is the fact stated by Frontinus that the curators, who were only required to give a quarter of their time to their official duties, often employed the *aquarii* on private contracts which they undertook.

The effects of the neglect of the aqueducts and of the unauthorized tapping, leakage, &c., were such that in the time of Frontinus occasionally two or more of the aqueducts did not deliver any water at all into Rome. The famous Aqua Claudia and Anio Novus, which were completed in 52 A.D., after fourteen years spent in their construction, failed to deliver any water into the city from 62 to 71 A.D. Although some very

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 991.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	21½—22½*	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15—16*	..	4 13 9
300,000	100	July 3	5	Australian 5 p. c. Deb. .	102—104	..	4 16 2
200,000	5	May 12	6	Bombay, Ltd. . . .	6—6½	..	4 12 3
40,000	5	,,	6	Do. New, £4 paid .	4½—4¾	..	5 1 1
880,000	Stk.	Aug. 16	12	Brentford Consolidated	277—282	..	4 5 1
270,000	,,	,,	9	Do. New . . .	210—215	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
159,375	,,	June 15	4	Do. 4 p. c. Deb. .	126—130	..	3 1 7
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig. .	275—265	..	4 6 9
226,820	,,	,,	8½	Do. A. Ord. Stk. .	190—195	..	4 7 2
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11
420,000	20	Sept. 29	10	British	43—45	..	4 8 11
50,000	10	Aug. 31	12	Bromley, Ord. 10 p. c. .	24—26	..	4 12 3
75,000	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9½—10*	..	6 0 0
220,000	Stk.	June 29	4	Do. 4 p. c. Deb. .	100—102	..	3 18 5
150,000	20	July 13	8½	Cagliari, Ltd. . . .	28—29	..	5 13 10
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	12½—14½	..	5 10 4
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	57—59	..	5 1 8
550,000	Stk.	Oct. 13	13½	Commercial Old Stock .	310—315*	..	4 5 9
200,750	,,	,,	10½	Do. New do. .	240—245*	..	4 5 9
200,750	,,	June 15	4½	Do. 4½ p. c. Deb. .	143—148	..	3 0 10
800,000	Stk.	June 15	10	Continental Union, Ltd.	182—187	..	5 7 0
200,000	,,	,,	7	Do. 7 p. c. Pref. .	182—187	..	3 14 10
51,600	Stk	Aug. 31	14	Croydon A 10 p. c. . .	335—340	..	4 2 4
168,400	,,	,,	11	Do. B 7 p. c. . .	265—270	..	4 1 5
555,000	Stk.	Aug. 16	6½	Crystal Palace Ord. 5 p. c.	132—137	..	3 16 8
60,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
486,090	10	July 28	11	European, Ltd. . . .	21½—22½	..	4 17 9
354,060	10	,,	11	Do. £7 10s. paid .	15½—16½	..	5 0 0
14,998,075	Stk.	Aug. 16	4⅝	Gas-light and Coke	4 p. c. Ord. . .	103—105	.. 4 13 4
2,500,000	,,	,,	3½		3½ p. c. max. . .	97—99	.. 3 10 8
3,799,735	,,	,,	4		4 p. c. Con. Pref.	120—123	.. 3 5 1
3,993,975	,,	June 15	3		3 p. c. Con. Deb.	99—101	.. 2 19 5
70,000	10	May 31	8	Hongkong & China, Ltd.	14—15	+½	5 6 8
3,800,000	Stk.	May 12	10	Imperial Continental .	220—225	..	4 8 11
473,600	Stk.	Aug. 16	3½	Do. 3½ p. c. Deb. Red.	101—104	..	3 7 4
75,000	5	June 15	6	Malta & Medn., Ltd. .	5—6¼	..	5 9 1
560,000	100	Oct. 2	5	Met. of	5 p. c. Deb.	110—114	.. 4 7 9
250,000	100	,,	4½	Melbourne and	4½ p. c. Deb.	108—110	.. 4 1 10
541,920	20	May 31	5	Monte Video, Ltd. . .		12½—13½	.. 7 8 1
617,946	Stk.	Aug. 31	9½	Newc'tle & Gatesh'd Con.		225—230	.. 4 0 5
264,855	Stk.	June 29	3½	Do. 3½ p. c. Deb. .		106—109	.. 3 4 3
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	May 31	8	Oriental, Ltd. . . .	7½—8	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—7	..	5 14 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅝	..	4 11 5
60,000	5	Sept. 29	7	Ottoman, Ltd. . . .	5½—5¾	..	6 1 9
500,000	100	June 1	6	People's Gas of Chicago	2nd Mtg. Bonds .	102—106	.. 5 13 2
851,070	10	Oct. 13	7	River Plate Ord. . . .		11—11½*	+¼ 6 1 9
250,000	Stk.	June 29	4	Do. 4 p. c. Deb. .		100—102	.. 7 8 2
250,000	10	Sept. 15	10	San Paulo, Ltd. . . .		12—13	−½ 7 13 10
135,000	Stk.	Sept. 15	10	Sheffield A.		247—245	.. 4 0 4
209,053	,,	,,	10	Do. B.		247—249	.. 4 0 4
447,427	,,	,,	10	Do. C.		247—249	.. 4 0 4
5,600,000	Stk.	Aug. 16	5½	South Metrop., 4 p.c. Ord.		137—140	.. 3 16 1
1,520,000	,,	July 13	3	Do. 3 p. c. Deb. . .		101—103	.. 2 18 3
120,000	Stk.	Aug. 31	6	Tottenham and	A. 5 p.c. B. 2½ p.c.	141—143	.. 4 3 11
250,520	,,	,,	4½			102-104	.. 4 6 6
55,100	,,	—	4	Edmonton	4 p.c. Deb..	115—120	.. 3 6 8
182,380	10	June 15	5	Tuscan, Ltd.		9—10	.. 5 0 0
149,900	10	July 3	5	Do. 5 p. c. Deb. Red.		98—100	.. 5 0 0
				WATER COMPANIES.			
746,184	Stk.	June 29	11	Chelsea, Ord.		313—318	.. 3 9 2
150,000	,,	,,	5	Do. 5 p. c. Pref. .		163—164	.. 2 19 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75		145—150	.. 3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb. .		150—155	.. 2 18 1
1,720,560	Stk.	Oct. 13	7	East London, Ord. . .		203—208*	.. 3 7 4
654,740	,,	June 29	4½	Do. 4½ p. c. Deb. .		152—157	.. 2 17 4
390,000	,,	,,	3	Do. 3 p. c. Deb. .		101—103	.. 2 18 3
700,000	50	June 15	7½	Grand Junction	10 p. c. max.	4 p. c. Deb. .	109—112	.. 3 7 0
310,000	Stk.	Sept. 29	4				133—138	.. 2 18 0
708,000	Stk.	Aug. 16	14	Kent		350—355	−5 3 18 11
160,000	,,	,,	7	Do. New, 7 p. c. max. .		208—213	.. 3 5 9
1,043,800	100	June 29	10½	Lambeth, 10 p. c. max. .		295—300	−5 3 10 0
406,200	100	,,	8	Do. 7½ p. c. max. .		225—230	.. 3 9 7
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb. .		136—140	.. 2 17 2
500,000	100	Aug. 16	12½	New River, New Shares		430—435	.. 3 2 0
1,000,000	Stk.	July 28	4	Do. 4 p. c. Deb. .		135—140	.. 2 17 2
902,300	Stk.	June 15	7½	South-wark and Vauxhall	Ord. . . .	267—272	+2 3 10 9
126,500	100	,,	7½		7½ p. c. max. .	193—198	.. 3 15 9
499,200	Stk.	,,	5		5 p. c. Pref.	165—170	.. 2 18 10
1,019,585	,,	Oct. 13	4		4 p. c. A Deb.	131—136*	.. 2 18 10
1,155,066	Stk.	June 15	10	West Middlesex . . .		398—393	−2 3 6 0
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .		152—157	.. 2 17 4
200,000	,,	Sept. 15	3	Do. 3 p. c. Deb. .		101—103	.. 2 18 3
				* Ex. div.			

minute records were kept as to how the water was supposed to be distributed both within and outside the city, Frontinus, who appears to have been a very conscientious official, found that great frauds and irregularities had been committed in these records. To rectify this matter, he undertook to gauge the nine aqueducts existing at his time.

The facts briefly mentioned above lead to the inference that the conditions of waste and frauds in the water supply were probably much worse in Rome than they are in any modern city.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The laying of the foundation stone of the new gas-works at Granton for the Edinburgh and Leith Gas Commissioners, on Monday, was a notable event. What the future may have in store for us, we know not. At this moment, when there is a quiver in the air, and there is a feeling, not of "lest we forget," but of "lest we be forgotten," and the tide of Imperial State should receive a check, the mind turns to the thought of what might be the fate of so gigantic an undertaking were this to happen. But a pessimistic mind is not a lovely one; and I presume that few who have to do with the new works, and still fewer of those upon whom the burden would fall were national reverse to be our lot, have any expectation, or fear, that such will be the case. Judged by all ordinary canons, the adventure is a sound one financially, and a commendable one practically. To shut the eyes to possible danger is, however, a process which may be overdone. I wonder if anyone ever thought of the risks, or possibilities, in time of war, when the Granton site was selected. I suppose not. Yet consider how it stands. The works are on the shores of the Firth of Forth. What would be the effect, in the matter of reducing the Capital of Scotland to abject submission, should a foreign cruiser be able to pass the fortifications and submarine defences which guard the lower reaches of the Firth? A few shots would suffice to throw the city and district into darkness; and history tells significantly of how the terror by night operates upon the nerves of communities. We in these islands have been accustomed to live in such security from foreign attack that we have all but forgotten that it is possible; and there is scarcely a single institution in our country—not even our railways—which has been laid down with a view to strategic purposes. We are a nation of shopkeepers; and we put our shops down where they suit ourselves. Before any foreign foe can get at the till, or the safe, he has our great first line of defence to encounter. The Granton Gas-Works will have, and can have, no higher security. This reflection is not intended to be alarmist, but rather, by directing attention to one vulnerable spot, to emphasize the need—at the present time, I admit, quite appreciated—which there is of seeing that our Naval defences are kept in a state of the most thorough equipment.

I need not pursue this subject further; but while I have been writing these lines, there has occurred to me another thought, not of war or its results, but of some consequences which the preparation for war may have upon the new gas-works. The batteries of one of the local corps of Artillery Volunteers are situated at Granton. Will the firing of the guns there have any prejudicial effect on the plant at the gas-works? I recollect that the Musselburgh Gas Company some years ago protested against the firing of cannon in the vicinity of their works, on the ground that the vibration was shaking their apparatus to pieces. I think nothing came of the protest; but it existed all the same. If there should be any inconvenience felt from the practice of the volunteers at Granton, the batteries can be shifted—say, to Inchkeith, where Government fortifications already exist.

As to the ceremony itself, there is not much to be reported, apart from the speaking, given in another column (p. 1003), and which there was too much of. It was a purely municipal gathering; there being a marked absence of strangers, either scientific or technical. Probably the occasion for them to visit will be when the gas is turned on, by which time there will be something to be seen. At present the site is one extensive upheaval; gaping trenches, banks of earth, lines of rails, piles of bricks, mounds of broken stone, and groups of workmen, making a chaotic scene out of which it looks to the unpractical eye as if it would be impossible to extract order. Yet we know that in two years all will be order, and that, given ordinary conditions, Mr. Herring will have then produced a works to the satisfaction of himself and his Commissioners. It is a large undertaking; but it is in good hands.

There is one incident of the ceremony which I feel ought to be chronicled. The speaking was very extensive; and there was no provision for the pressmen, for the taking down of the speeches. As it was desirable that a good report of the proceedings should appear in the "Journal," your representative, as soon as the stone was laid, appropriated it as a table upon which to lay his note-book. The first use to which the foundation stone was put was thus in the service of the "Journal." Who shall, in future, venture to say that there is not a close connection between the gas industry and the Technical Press which is devoted to it?

The Corporation of Arbroath have obtained a Provisional Order empowering them to furnish electric light. A Queen's Printers' copy of the Order was laid before the Gas Corporation—who were the promoters of it—on Monday. Judging from the tone of the remarks which were indulged in, there is not much happiness among the members over their new acquisition. Provost Grant recommended them to begin the study of the Order at once. It was, he thought, not to be an easy subject. They would have to introduce electricity in less than two years, if they were to retain the matter in their own hands; and they would need all their time. The members were rather startled to learn that of the two years which they are allowed, more than two months have already elapsed. A Special Committee of the Corporation was appointed to fully consider the matter, and to ascertain what has been done in other places similar in size to Arbroath.

An explosion of gas, which took place in Dundee on Thursday morning, should go towards opening the eyes of some to the dangers of pilot-lights. A linen merchant had his office in Commercial Street lighted by means

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CLAUS' PATENT SULPHUR-RECOVERY PLANT.

SELF-SEALING RETORT-MOUTHPIECES. LIFTING APPARATUS. CENTRE & FOUR-WAY VALVES.

MAKERS OF WECK'S PATENT CENTRE-VALVE.

TAR-DISTILLING PLANT. CONDENSERS. WOOD SIEVES.

TAR-BURNERS. ROOFS. GIRDERS, &c., &c.

Makers of Cripps' Patent Grid Valve and Hydraulic Main Valve.
Makers of Holgate's Patent Gas-Purifying Plant.
Makers of Tysoe's Patent Self-Sealing Mouthpiece.

of incandescent gas-lamps, furnished with pilot-lights. When a clerk entered the office in the morning, he noticed a strong smell of gas; and, perceiving that the pilot-lights were out, he procured a taper to re-light them. The explosion followed. It does not appear to have been a very great affair; but there was some damage to glass and the like. The pilot-light, except in exceptional situations, should be abolished—if this experience counts for anything.

The Oil-Gas Enrichment Company, Limited, in earning a profit of £493, have more than sufficient to pay a 5 per cent. dividend upon their preference shares—the same as in previous years; and they carry forward enough to pay 3 per cent. upon the ordinary shares. The acquisition of another patent connected with the manufacture of gas is being negotiated for, which points in the direction of the continued fertility of the mind of Mr. W. Young, of Peebles, the inventor of the system of oil-gas making which is owned by the Company.

An untoward incident occurred in connection with the electric lighting of Edinburgh, on Wednesday night. About 9.30 the lights in the area which is served by the high-tension system—the outlying districts, such as Newington, Grange, Morningside, Merchiston, Murrayfield, Inverleith, and Portobello—suddenly went out. The cause was a fire which had broken out in the central station at Dewar Place. The part affected was the switch-board controlling the high-tension system. It is not known what started the fire; but it is believed to have been caused by some of the wires fusing. The fire itself was not a serious matter; the firemen being able to extinguish it in about fifteen minutes. But while it lasted it was the occasion of a good deal of terror among the members of the Fire Brigade, on account of frequent explosions which took place in the midst of the flames. These are phenomena which are not well understood; and their existence was decidedly alarming. When the fire was got under, the artificers in the station set about restoring the plant, and were able to turn on the current again at 2 a.m.—that is, in 4½ hours after the consumers were deprived of light. Had the plant been in duplicate, this would not have occurred. This is an expenditure which it will be necessary for the Corporation to consider. In nearly all gas-works of any size, the plant is in duplicate—or at least so disposed that, in emergencies, bye-passing can be resorted to—and the supply of gas, if interrupted, is usually only so for a few minutes. In the present instance, there was a newspaper proprietor who has introduced extensive plant into his premises, driven by electricity. This man's state of mind was heart-rending. Most owners of machinery can put off for a few hours, or days, the execution of an order; but a newspaper must go to press at a stated hour, or great disturbance is caused—not merely by the loss of sales, but in adjustments with advertisers, and the like. As a matter of fact, this gentleman's office was not served by the switch-board which was consumed; and his fears were happily not realized. But his alarm was none the less great.

Some time ago Mr. Robert Irvine, a Director of, and Consulting Chemist to, Messrs. A. B. Fleming and Co., Limited, widely known as printing ink manufacturers at Granton, applied to the Court of Session for interdict against the blasting operations which were being conducted in connection with the construction of the tank of a new gasholder for the Edinburgh and Leith Gas Commissioners at Granton. There were two alternatives in the application—the one to prohibit blasting altogether, and the other to prohibit its being done in such a way as to throw stones or other missiles into the grounds of Mr. Irvine's residence at Caroline Park House, Granton. Lord Stormonth-Darling gave interim interdict in terms of the second alternative; and with that the Gas Commissioners were quite content, there being no desire, on their part, that anything which the Contractor might do should injure their neighbours. Accordingly, they gave their consent to the interim interdict being made perpetual; and Tuesday this week Lord Stormonth-Darling granted a motion by Mr. Irvine's Counsel, that it be made perpetual. The Commissioners were found liable to the pursuer for the whole of the expenses of the application.

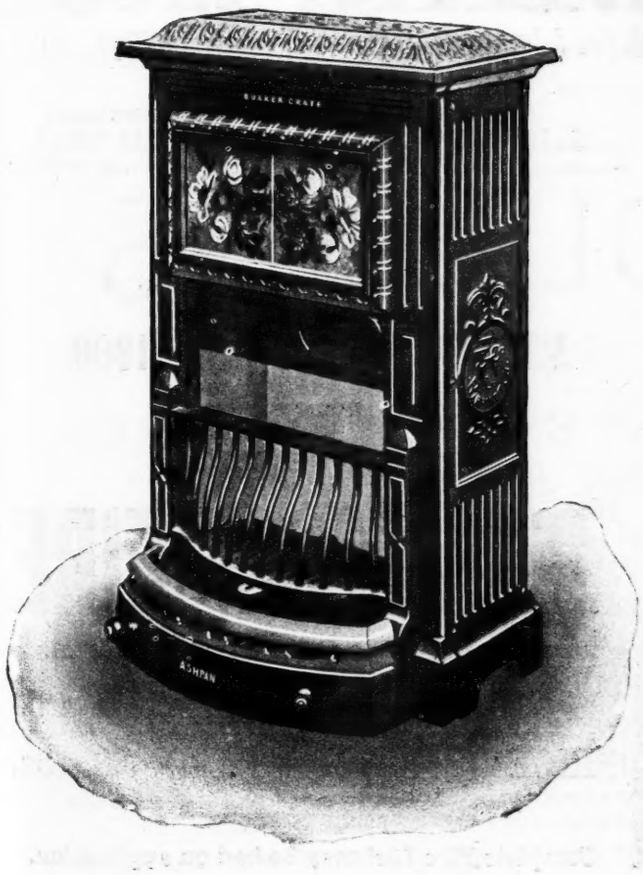
Early on the morning of Saturday last a large water-main burst in the town of Paisley; and the escaping water did much damage, in the tearing up of the streets and the flooding of premises. The flow was not checked till the reservoir at Stanley was emptied; the loss of water—all filtered—having been 100,000 gallons. The fractured pipe was replaced during the day; but in the meantime there was much inconvenience in the higher parts of the town.

The fly in the pot of ointment has the evil reputation of which we have all heard. One troublesome person in a community may similarly prove a great scourge. Such is the feeling with which the people of Alyth view the action of one of their number. The gentleman imagined that certain arrangements which were being made by the Police Commissioners with reference to the burgh water supply would have the effect of limiting the supply to his works; and he brought the Commissioners into Court to have them interdicted from continuing the new arrangements. He was altogether unsuccessful; but the protracted litigation has run up a bill of expenses which is not far short, if any, of £1500. Of this sum, about £1000 falls upon the pursuer and the balance upon the town, whose representatives did not at first adopt the line of defence upon which they won. The Commissioners are about to issue a bond over burgh property, in order to raise funds wherewith to meet the outlay. It is the old story. When misunderstanding arose between the two sides, and while they were fighting over what turned out to be a triviality, lawyers and professional men secured the oyster.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 21.

Sulphate of Ammonia.—In the early part of the week, prices were fairly well maintained; but later the market gave way, and values have declined to £11 to £11 2s. 6d. per ton, delivered f.o.b. at the ports. Larger buying has barely kept pace with increased production, and the eagerness of makers to dispose of their output. Then, forward selling in London on the level of prompt prices has encouraged speculative selling in that position at a further discount; and the spot market has not been able to withstand this depressing influence. London is reported to have



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been done at £10 18s. 9d. per ton, Beckton terms, delivery up to March; and at the close there are no buyers at the price.

Nitrate of Soda is firm at 7s. 9d. per cwt. for good, and 7s. 10½d. per cwt. for refined, quality.

LONDON, *Oct.* 21.

Tar Products.—The position generally speaking is steady; and although in some instances buyers are endeavouring to depress values, makers so far have not reduced prices. An effort to secure large lines of creosote at lower rates for forward delivery has somewhat affected that article; but it is doubtful if any important business has been booked at lower rates than quoted below. Carbolic acid is much sought; and it looks as if that article will see even yet a better price. For heavy naphtha also, there is a good deal of inquiry; but the production is small and apparently insufficient for the general demand. Solvent naphtha is steady; and both benzol and toluol maintain their former rates.

The average prices of the week are: Tar, 16s. 6d. to 25s. 6d. Pitch, east coast, 33s. to 34s.; west coast, 32s. Benzol, 90's, 9d.; 50's, 10d. Toluol, 90 per cent., 1s. 3d.; pure, 2s. Solvent naphtha, 1s. 3d. Heavy naphtha, 1s. 2d. Crude, 30 per cent., naphtha, 4¾d. Creosote, 3¼d. Heavy oils, 70s. Carbolic acid, 60's, 2s. 2d.; 75's, 2s. 8d. Crude naphthalene, 55s. Anthracene, nominal "A," 3½d.; "B," 2½d.

Sulphate of Ammonia.—A determined effort to depress the price of sulphate has been temporarily successful; but no important business as to quantity is being done at the prices prevailing, which are marked at about £11, less 3½ per cent. at all ports.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The feature that is just now most noticeable in the coal trade here is the very strong upward tendency in prices. Notwithstanding the large buying that went on at the close of last month in anticipation of the advance which then took place, there has been no appreciable falling off in the demand, which continues more than sufficient to take away all that collieries can raise. Stocks go on decreasing, with the prospect that before the end of the year they will be almost entirely cleared off, and that collieries will have to face the extra demand during the remainder of the winter as best they can with the current production of the pits. Not only is there the probability of this scarcity of supplies, but the miners are moving for a further advance of 5 per cent. in wages, which will certainly have to be conceded very early in the ensuing year. Under these conditions, it is not at all surprising that the question of prices has again been brought forward; and considering the very strong feeling that prevails in favour of an immediate further advance, it is quite on the cards that there may with the close of the month be another upward move all round in prices. At a meeting of the Lancashire Coal Sales Association, held in Liverpool, many of the West Lancashire representatives strongly urged that both round coal and engine fuel should be put up 10d. per ton on Nov. 1; and the leading firms in the Manchester district, who form a separate Association, are also in favour of a further upward move in prices. Whether general consent will be obtained to this upward move with the close of the present month, is for the present somewhat doubtful; but it may be taken for granted that a substantial advance at a very early period is certain. Before the close of the year, undoubtedly all descriptions of fuel for gas making purposes and general manufacturing requirements will be raised 10d. per ton; and in all probability house-fire coals will be put up 1s. 8d. At the pit, current rates remain at about 12s. 6d. to 13s. 6d. per ton for best Wigan Arley, 11s. to 11s. 6d. for Pemberton four-feet and seconds Arley, 10s. 6d. for common house coal, 10s. for steam and forge coal, with engine fuel from 5s. 6d. to 6s. for common, 6s. 6d. to 7s. for medium, and 7s. 6d. for best sorts. Colliery proprietors are, however, declining to quote for forward contracts on the basis of these rates. Shipping is fairly good, with only limited supplies offering in this branch of trade; and prices are firm at about 10s. to 10s. 6d. per ton for ordinary steam coal, and from 11s. 6d. upwards for better qualities, suitable for house-fire purposes, delivered at the Mersey ports or the Manchester Ship Canal. Lancashire makers of foundry coke have not intimated any official advance in list rates, which remain at 26s. to 27s. at the ovens; but they report a demand in excess of the supply. In furnace cokes, prices have hardened up somewhat; 20s. to 21s. being now obtained for good sorts at the ovens.

Northern Coal Trade.—The coal trade shows renewed activity, with a considerable increase in the demand. There has been a check to the fall in the price of steam coals; and the value of some other kinds has been more firmly maintained. In best Northumbrian steam coals, the collieries are again fully at work; and the price is steady at 11s. per ton f.o.b., second class steam coals being 10s. 6d., and steam smalls 7s. to 7s. 3d. For gas coals, the demand is a very strong one; and the production is barely sufficient to meet all the needs. Indeed, some of the contracts are considerably behind; and thus prices for any occasional cargoes beyond contracts are very high. About 11s. per ton f.o.b. is now the quotation for such additional supplies; and though lower prices have been taken, for some best Durham gas coals there is even a higher quotation. Gas coke is quoted at 14s. per ton locally; but there is a much larger supply, and the exports seem to be rather less. The manufacturing consumption of gas coke is very heavy.

Scotch Coal Trade.—The demand continues good for home consumption, but shipping is not in a hopeful position. House coal has been advanced 6d. per ton. Usually the increased price is put on a week or two earlier. Though the winter season is on, stocks are beginning to accumulate. Present prices quoted are: Main 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 9d. to 10s. 9d., and splint 10s. 6d. to 10s. 9d. The shipments for the week amounted to 202,968 tons—an increase of 58,485 tons upon the previous week, but a decrease of 3716 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,990,756 tons—a decrease of 820,220 tons upon the same period of last year.

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Broadstairs Water Supply.—Concerning the discontent which has existed for some time past at Broadstairs in connection with the supply of the Water Company, we learn that a report on the subject has been submitted to the District Council by Mr. W. A. Valon; and, acting under his advice, they have determined to apply to the Board of Trade to appoint an Engineer as Arbitrator between themselves and the Company. This will probably necessitate the postponement until next year of the proposal to purchase.

The Bingley District Council and the Cullingworth Gas-Works.—The Bingley District Council yesterday week once more discussed the question of purchasing the Cullingworth Gas-Works. The Gas Committee recommended that an offer of £8000 be made for the property, on condition that the portion not required be repurchased by the vendors for £2000. Mr. Gatecliff moved the adoption of the recommendation. It was stated that it was an increase of £1000 upon the first offer made a few months ago. In the discussion, some blame was cast upon the former Improvement Commissioners for selling the right some years ago to supply Cullingworth; but Mr. Gatecliff defended this action as the best course open to the Commissioners at the time. An amendment was moved that the question be referred back to the Committee. This was defeated, and the recommendation was adopted.

Poisoning by Coal Gas.—Dr. G. Danford Thomas held an inquest at Islington last Tuesday, on Herbert Bolton Windsor, aged 38. The evidence showed that Mr. Windsor, who was described as a stockbroker, had experienced business troubles, and was addicted to drink. On the previous Friday he was intoxicated when he went to bed; and as he was not heard of the next day, the door was forced. Mr. Windsor was found dead, the cause of death being gas poisoning. He had placed the tube of a gas-stove in his mouth, turning on the tap, and had fastened the tube with a piece of string, which was tied round his neck. A verdict of "Suicide while of unsound mind" was returned. Last week a young man who had endeavoured to obtain relief from neuralgia by inhaling coal gas, under the supposition that it was the same as that used by dentists, lost his life as the result of his experiment.

Forthcoming Arbitrations.—Two arbitrations in connection with gas-works purchases will take place in London next month. The price to be paid by the Brigg District Council for the property of the Gas Company, will (it is expected) be the subject of proceedings early in the month. Mr. E. H. Stevenson is the appointed Arbitrator for the Council, and Mr. H. E. Jones for the Company. The witnesses who will support the case of the former are Mr. W. A. Valon and Mr. Charles Hunt; and Mr. Corbet Woodall and Mr. Thomas Newbigging will appear on behalf of the Company. The proceedings at which the value of the Skipton Gas Company's undertaking will be discussed will commence on Nov. 20. In this case the Arbitrator for the District Council will be Mr. Charles Hunt, and for the Company Mr. Corbet Woodall. The witnesses for the Council will be Mr. W. A. Valon, Mr. Alfred Colson, and Mr. John Waugh; and to sustain the claims of the Company, Mr. E. H. Stevenson, Mr. W. R. Chester, and Mr. Robert Porter will appear. The Umpire will be Mr. James Mansergh.

Extensive Water-Main Alterations at Nottingham.—A tremendous amount of work has been involved in connection with the Water Department of the Nottingham Corporation by the passing of the new Great Central Railway through the city. The total length of mains (from 18 inches downwards) disturbed exceeded four miles. Altogether the diversions, alterations, &c., cost about £10,000, the major portion of which was paid by the Railway Company. It is further interesting to know that most of the pipes disturbed were replaced by new ones, and virtually cost the Corporation nothing.

Water-Rate Concession to Willenhall.—The town of Willenhall has for many years obtained its water supply from the Wolverhampton Corporation; and although the latter have been making a very handsome profit, which has been applied in relief of the rates, Willenhall has not participated in any way. On the contrary, the Willenhall people are charged a higher price for water than the Wolverhampton consumers. This has long been a matter of complaint in Willenhall; and the District Council of that town, with the assistance of Sir Henry Fowler, M.P., have at length obtained a concession from Wolverhampton, and in future Willenhall and that borough will be charged equal rates. This means a saving to the Willenhall water consumers of somewhere about £400 per annum.

Colonial Gas Association, Limited.—At the annual general meeting of this Association next Tuesday, the accounts to be presented, covering the twelve months ending June 30, will show a profit of £3809, from which amount £946 was paid in April as an interim dividend. After providing for interest on debentures, &c., there remains a balance, including the amount brought forward, of £2437. The Directors recommend a dividend for the past half year at the rate of 4 per cent. per annum, tax free (making 3¼ per cent. for the year), absorbing £1515, and the transferring of £500 to the reserve fund; leaving £421 to be carried forward. The Managing-Director in Australia (Mr. Swinburne) reports that the works and mains are in good condition, and that he expects a further increase in the consumption of gas during the current year; the indications generally of returning prosperity in the Colonies being very encouraging.

Ironmongers and Municipal Trading at Oldham.—A small deputation from the Oldham Ironmongers' Association recently had an interview with the Corporation Gas Committee, with a view to getting them to consider the advisability of ceasing to sell gas-stoves by retail, because it was found that such sale interfered with the business of the ironmongers. There was no objection on the part of the Association to the letting out of stoves on hire. If the Committee could not see their way to acquiesce in this desire, it was suggested that perhaps they might cease selling gas-heating stoves, gas-ironers, and other small articles. The objection was that the Corporation sold these things at too low a profit; while competition among the ironmongers prevented them making too much profit on such goods. Mr. A. Andrew, the Superintendent of the department, stated that the sale of the articles referred to was very slow. The Committee decided to make inquiries into the matter, and then further consider it.

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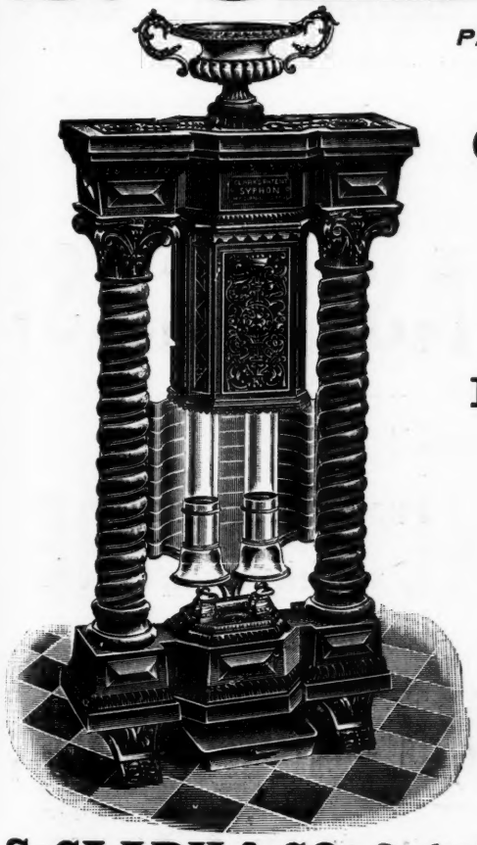

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Amendment of the Clitheroe Gas Act.—The Clitheroe Town Council on Friday resolved to apply for a Provisional Order to amend the Clitheroe Gas Act of 1861, so that they may be empowered to deal in gas-stoves and other apparatus.

Completion of the Gas-Works Extension Scheme at Ripon.—The Mayor of Ripon (Alderman A. Wells) performed an interesting ceremony at the Corporation Gas-Works last Friday by turning on the supply of gas to the new holder, which has lately been completed by Messrs. W. C. Holmes and Co., of Huddersfield; this being the concluding contract in the gas-works extension scheme, on which the Corporation have during the last year spent £10,000. The whole of the work has been engineered successfully by Mr. E. E. J. Anderson, the Gas Manager. The Mayor, after turning on the gas, said he had no doubt that in a very short time the citizens would reap very great benefit from the extensions; and Mr. Moss, a member of the Gas Committee, congratulated Mr. Anderson and Messrs. Holmes on the manner the work had been carried out.

Gas Supply in Buenos Ayres.—According to the Buenos Ayres Correspondent of the "Chemical Trade Journal," shareholders in the Primitiva Gas Company of that city have met to take into consideration a proposal made to the Directors to convert the concern into an English Company. The actual capital is $4,000,000 (paper), and the new Company would have a capital of £1,200,000, divided as follows: £800,000 in 6 per cent. preferred shares and £400,000 in ordinary shares; and £400,000 in 4 per cent. debentures would be issued as soon as the contract is signed, the proceeds to be used for improvements. The shareholders in the Primitiva Company would receive £10 in preferred shares and £5 in ordinary shares for each $50 share they now hold; they would also have the right, for ten days after the scheme is approved, to receive £10 in cash instead of the preferred share. There would be a local directorate in Buenos Ayres and a Board in London. Our contemporary's correspondent says there is every probability of the project being accepted by a majority of shareholders, and not being blocked as the former scheme.

The Cost of Collecting Gas and Water Rentals at Manchester.—A series of articles, by Mr. S. Norbury Williams, is being published in the "Manchester City News," under the heading of "An Elective Auditor's Notes." In the last instalment, he gives the cost of collecting the gas and water rental, "as many people hold a strong view that the accounts owing to the various departments of the Corporation might be got in at a much smaller expenditure than is at present the case." There are, he states, 31 gas collectors, whose salaries vary from £300 to £148. Five get £300 a year; seven £250 to £300; and thirteen between £200 and £240. The total is £7536. In addition, salaries are paid to the heads of the Gas Department in the Town Hall, and at the various stations, amounting to £5497; to the clerical staff, £7294; to the prepayment meter inspectors, £3961; to the ordinary meter inspectors, £5506; and to broken period inspectors, £694. To the cashier, assistant cashier, and receivers of rents in the office at the Town Hall £1005 is also paid. To the seventeen water-rate collectors, £3298 was paid last year. One received £300; another £270; and nine £200 and over. The salaries paid to the heads of this department amounted to £5919; and the wages in connection with the general business of the department totalled to £7031.

The Charge for Gas in London.—The Clerkenwell Vestry have passed a resolution "requesting the Leader of the House of Commons to at once put into operation the new sliding-scale recommended by the Parliamentary Committee who inquired into the Gas Companies charges." It was stated that if this were done, it would have the effect of immediately reducing the price of gas to private consumers from 3s. to 2s. 6d. per 1000 cubic feet.

The Farnham Urban District Council and the Gas-Works.—At a meeting of the owners and ratepayers of Farnham, held on Monday last week, it was resolved, by 46 votes to 38, to promote a Bill next session to authorize the Urban District Council to acquire the undertaking of the Farnham Gas Company. As a large number of persons had left the meeting (which lasted more than two hours) when the vote was taken, a poll was demanded.

Bradford and the Clayton Gas Company's Works.—Mr. W. H. North, a candidate for municipal honours at Bradford, speaking at a meeting of the ratepayers of the Allerton ward, urged that the Corporation should buy the undertaking of the Clayton Gas Company, as an act of justice to Allerton. He had reason to believe that the Company were prepared to treat with the Corporation, and to sell their concern with all its rights for such a sum as would bring in the same amount at 3 per cent. to the shareholders as they had at present. This would mean the issue by the Corporation of £110,000 in 3 per cent. bonds. By selling gas to the out-districts, he believed that the Corporation would make a profit on the transaction.

The Price of Gas at Stockton.—The passing of a resolution, at a recent meeting of the Stockton Corporation, by which the price of gas is raised 1½d., instead of 3d. as previously agreed, will, the "Northern Echo" says, cause the gas-works to suffer to the extent of £2100 in revenue. The Stockton ratepayers, too, will suffer to the extent of a penny rate by the fact that the separately rated townships of Norton and Thornaby absorb £630 of this sum; so that, though they have the apparent advantage now of getting gas at 1½d. per 1000 cubic feet less than the price originally proposed by the Gas Committee, in the long run they will pay through the nose for it, for these sums of £2100 and £630 will not be available for the reduction of the rates, as they would have been under the original proposal. The townspeople may therefore expect a substantial increase in their rates on this account, though matters may be more than equalized by the promised reduction in the loss on the water-works and on the quay, and by the fact that the valuation of the borough has been raised by no less a sum than £9000. The total capital of the gas-works is £110,000; and a gross profit of only 6 per cent. is made upon this, without allowing for interest and redemption. The Gas Committee therefore naturally think a mistake was made by decreasing the proposed net charge of 2s. 3d. by 1½d., inasmuch as, under the present contracts, they are paying 2s. 9d. a ton more for coal than two years ago, and 1s. 6d. more than last year. Under the circumstances, the gas-works at the end of the year will be convicted on the face of the balance-sheet as a declining municipal undertaking, whereas the reverse is the case.

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Havana Water Supply.—The water supply of Havana is collected from springs at the base of a range of coral hills, and carried through a masonry aqueduct, 33,000 feet long, to a reservoir holding 21 million gallons. The consumption and waste of water in the city is estimated at 173 gallons per head per day. The city is supplied by gravitation from the reservoir.

The Value of Inspection of Water-Fittings.—A great saving of water has resulted from the system of fittings inspection introduced at Nottingham last year in conjunction with the Deacon waste-water meter system. The total population supplied with water by the Corporation is 262,277, of which 219,916 are in the city, and 42,361 in the districts beyond. The fittings in the whole area supplied comprise 84,950 taps (hot and cold), of which 29,334 were found defective on inspection up to last December; and 28,425 were repaired by the waste inspectors—leaving 909 to be repaired by owners. The total number of houses, shops, &c., inspected was 63,903, of which 54,188 were in the city, and 9715 in the outside districts.

An Auxiliary Water Supply for Wallasey.—A long debate upon the water supply question took place at the meeting of the Wallasey District Council last Wednesday. There has been considerable discussion for some time as to whether the Council shall obtain an auxiliary supply of water from the Liverpool Corporation or from the West Cheshire Water Company; and the Water Committee, through their Chairman (Dr. Oldershaw), now recommended that a proposed agreement with the Company should be accepted. In effect, it amounted to this—that, as soon as the pipes were laid, which would be in about five months, a minimum of 250,000 gallons of water daily would be delivered; and subsequently the quantity would be increased to a million gallons a day, which would be within twelve months' time. The minimum duration of the agreement was to be for ten years; and the price was to be 6d. per 1000 gallons up to a million gallons a day, and 5d. per 1000 if more than this quantity was taken. The Company would lay the mains as far as the boundary of the district. Of course, the proper thing for the district was to have a complete and independent scheme of their own. Such a scheme, however, needed time; and if they entered into the agreement with the Company, they would have ample opportunity to consider a supply of their own. The motion having been seconded, Mr. Steel moved that the minutes should not be confirmed; that the heads of the agreement with the Liverpool Corporation be adopted; and that the Corporation be requested to enlarge the maximum quantity of water to 2,700,000 gallons per diem. He argued that both as to quality and quantity, as well as to permanency of supply, the Liverpool scheme was very much to be preferred. The amendment was seconded; and several speakers then held forth as to the merits of the respective schemes. Dr. Oldershaw, in reply, said that the Liverpool project would cost £31,137, as against £30,000 for their own. He pointed out the features of the former which he considered placed it in an inferior position to the West Cheshire Company's. However, the amendment was carried by eleven votes to nine; and it was then agreed that the Committee should approach the Liverpool Corporation to see if they cannot get an alteration in the terms.

Bilston Water Supply.—Colonel J. T. Marsh has held an inquiry at Bilston into an application by the District Council for leave to borrow £1700. It was shown that the greater part of the money is required for main extensions to Bradley and Orton. There was no opposition; and the Inspector intimated his intention to report favourably.

Newton-in-Makerfield Water Supply.—The Newton-in-Makerfield District Council have sanctioned a proposal to borrow £17,000 for water-works purposes. A scheme has been approved for providing two bore-holes, with alternatives for the provision of tanks and duplicates to meet contingencies arising under the first section of the scheme; while the third section provides for reservoirs, &c. The total cost is estimated at £22,000.

Philadelphia Water Supply.—A Commission of experts was some time ago appointed to report upon the best method for the immediate improvement and extension of the water supply for the city of Philadelphia. They recommend that the water shall continue to be taken from the Delaware and Schuylkill Rivers, but shall be filtered by slow sand filtration before passing to the mains. This work will require some extension and improvement of the present pumping plants, and the construction of filter-beds capable of dealing with 200 million gallons of water per day at a total cost of about £2,194,500.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold debenture, preference, and ordinary stocks and shares in gas and water companies at very satisfactory prices. Some 4 per cent. perpetual debenture stock of the Southend Water Company fetched from £116 to £121 per £100 of stock. A few fully paid "C" shares (£10) in the Harrow and Stanmore Gas Company (last dividend £5 12s. per cent.) were purchased for £12 each. A new issue of £10 preference shares (5 per cent.) in the Caterham and District Gas Company, Limited, carrying dividend from the 17th prox., were for the most part sold at £11 10s. each; a few fetching £12 and £12 2s. 6d. A parcel of 130 "E" £10 preference shares (5 per cent.) in the Aldershot Gas and Water Company was next offered; 110 fetching £13 2s. 6d. each, and the rest £13. Some fully paid £5 shares in the Sunbury Gas Company (last dividend 4 per cent.) were sold at £5 5s. and £5 7s. 6d. apiece. On the following day, Messrs. Edwin Fox and Bousfield sold £720 of original ordinary consolidated stock of the Brighton and Hove Gas Company. Three lots of £100 each realized £270 per lot; and the remainder was disposed of at £269 per £100 of stock. The last half-year's dividend on this stock was at the rate of 11½ per cent. per annum. They also sold some ordinary consolidated "C" stock of the Wandsworth and Putney Company at £298 per cent.; and Mitcham and Wimbledon Company's "A" ordinary stock at £230 per cent. On Monday last week, Mr. J. Easter (Messrs. Easter and Wright) submitted to auction 1200 "B" £10 shares in the Eastbourne Gas Company, carrying interest at the rate of 11½ per cent. from the 1st prox. They were put up in 240 lots, and were disposed of in less than an hour at an average price of £24 per share. Last Tuesday, 40 shares in the Airdrie and Coatbridge Water Company, of £10 each, of the ordinary stock (1892 issue), were sold by auction, and realized from £14 2s. 6d. to £14 6s. each.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	BRANTFORD (Remodelled)	200,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000	ST. CATHERINES (Remodelled)	250,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000
COLCHESTER	300,000	PETERBOROUGH, ONT.	250,000
BIRKENHEAD	2,250,000	WILKESBARRE, PA.	750,000
SWINDON (New Swindon Gas Co.)	120,000	ST. CATHERINES (Second Contract)	250,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000	BUFFALO, N.Y.	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000
HALIFAX	1,000,000	COLCHESTER (Second Contract)	300,000
TORONTO	250,000	YORK	750,000
OTTAWA	250,000	ROCHESTER	500,000
LINDSAY (Remodelled)	125,000	KINGSTON, ONT.	300,000
MONTREAL	500,000	CRYSTAL PALACE DISTRICT	2,000,000
TORONTO (Second Contract; Remodelled)	2,000,000	DULUTH, MINN.	300,000
BELLEVILLE	250,000	CATERHAM	150,000
OTTAWA (Second Contract)	250,000	LEICESTER	2,000,000
		ENSCHEDE (HOLLAND)	150,000
		BUENOS AYRES (RIVER PLATE CO.)	700,000

And Additional Work, including complete Gas-Works at Nelson and Rossland, British Columbia.

The Amalgamated Society of Gas Workers, &c., of Birmingham, have completed their first ten years of existence; and last Tuesday was the tenth anniversary of the introduction of eight-hour shifts in the Corporation gas-works.

The name of Mr. Hiram Stevens Maxim (whose patent gas carburettor has been found so useful in many gas-works) appeared in the "Gazette" last week in the list of aliens to whom certificates of naturalization have been granted by the Home Secretary.

The question of the Douglas Town Council negotiating for the purchase of the Gas Company's works, rejected at the last meeting of the Corporation, is to be raised again at the approaching municipal contests, when the views of the candidates will be demanded by the ratepayers.

At the Mart, Tokenhouse Yard, to-morrow, Mr. Alfred Richards will offer for sale, by order of Directors and other owners, preference and ordinary stock and shares in the Southend, Portsea Island, Grays, and West Ham Gas Companies, and in the South-West Suburban Water Company.

We are asked by Mr. E. H. Millard to mention that the open-end cylindrical valve referred to in his paper read at the meeting of the North of England Association of Gas Managers (*ante*, p. 882) should have been attributed to Messrs. Willey and Co. instead of to Messrs. E. Cockey and Sons.

The Brussels Correspondent of the "Financial News" states that important coal contracts have just been concluded in England by some of the largest industries, many of which are using English coal mixed with Belgian. He adds that English coals are gradually getting a stronger foothold in Belgium, as is proved by the latest statistics.

At the annual general meeting of the German Incandescent Gaslight Company (Auer), recently held at Berlin, a dividend of 28 per cent. on the ordinary shares was declared for the year 1898-9. With regard to the prospects for the present year, it was stated that the turnover on the Company's own manufactures had increased during the first quarter by 54 per cent., and that the outlook was most favourable.

By an announcement which appears elsewhere, it will be seen that the Isle of Thanet Gas Company are inviting tenders for £8000 of 3½ per cent. ordinary stock; being part of the additional capital authorized to be raised by the Company's Act of last year. The dividend on the stock is subject to the sliding-scale; the initial price being 4s. 2d., and the present charge 2s. 6d. per 1000 cubic feet. The stock will bear dividend from February 9, 1900.

It has just been decided to adopt inclined retorts and coal-conveying machinery at the Margate Gas-Works; and Messrs. Jonas Drake and Son, of Halifax, have been entrusted with the work. The contract includes a retort-bench of eight arches, to produce one million cubic feet of gas per day; elevating and conveying machinery, and the structural ironwork in connection therewith; the roof over the retort-house and coal-store; elevating and conveying machinery, with engine and breakers, &c., for storing the coal; and plant for taking the coke from the retorts, and breaking and storing it in tanks and in the yard.

A pleasant gathering took place at the offices of the "Cannon" Hollow-Ware Company, Limited, Deepfields, near Bilston, on Monday last week, to commemorate the silver wedding of the Chairman, Mr. Richard Clayton. Hearty congratulations having been offered to Mr. and Mrs. Clayton by some of the old servants and heads of departments, the Secretary of the Company (Mr. John Mason), on behalf of all concerned, asked their acceptance of a silver 4-light candelabrum and a pair of silver candlesticks, accompanied by the hope that Mr. Clayton might live for some years to direct the business which had up to the present been so successfully carried on, and that both he and Mrs. Clayton might be spared to enjoy a long and happy life. The candelabrum bore the following inscription: "Presented to Richard Clayton, Esq., J.P., Chairman of the 'Cannon' Hollow-Ware Company, Limited, on the occasion of his silver wedding, as an expression of esteem and goodwill from the managers, agents, staff, and employees, Deepfields, 17th October, 1899." Mr. Clayton suitably acknowledged the gift, and testified his indebtedness to his wife for the opportunity afforded him of occupying the position he did in the Company.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.
JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for use in GAS-WORKS.
ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

SHEFFIELD CHEMICAL COMPANY, LIMITED.
BUYERS of Spent Oxide. Sellers of OXIDE OF IRON and SULPHURIC ACID.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see Oct. 3, p. 842]

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

IRON OXIDE (Bog Ore), best quality, for the Purification of Gas, containing up to 85 per cent. Hydrated Oxide of Iron, and absorbing while being used a high percentage of Blue.
S. BOWLEY AND SON, Wellington Works, Battersea Bridge, LONDON, S.W.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.
JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PATENTS FOR INVENTIONS.
Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

PRACTICAL RETORT SETTERS.
BATES & NUTTALL, 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

ENRICH your Gas with cheap Benzol.
Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.
Apply to SADLER AND CO., MIDDLESBROUGH.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

MELROSE CYCLES
SHOULD be bought by Gas and Water Officials. Ladies' No. 1, £10 10s.; No. 2, £8 10s. Gents' No. 1, £10; No. 2, £8. Highest Quality. Twelve Months' Guaranty. Sent on approval. Catalogue free. MELROSE CYCLE COMPANY, COVENTRY.

SEASON 1899.
BALE'S OXIDE OF IRON, of finest Quality. Summer delivery specially recommended for efficiency and economy.
FIRE CEMENT, PAINT, and CHEMICALS.
120 and 121, NEWGATE STREET, LONDON, E.C.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.
JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

BENZOL, specially made for the Enrichment of Gas.
ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

SULPHATE OF AMMONIA SATURATORS.
JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

WANTED, an Engagement by the Advertiser, a GAS MANAGER, with extensive Home and Colonial experience, who will be disengaged in the early part of the month of October. Well up in all the details of modern Gas-Works Construction and its Management, and the most approved Appliances introduced to economize the production of Gas and extend its use. Practically acquainted with both American and German Carburetted Water-Gas Plant and its manipulation. A good Draughtsman and Accountant. Satisfactory References and Testimonials.
Address No. 3332, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, for Water-Works, a Man with experience in the working of Worthington Engines and Boilers. Permanency to a suitable Man. Wages 26s.
Apply, by letter, to No. 3366, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Cost Keeping Clerk.
Apply to JONAS DRAKE AND SON, Gas Engineers, and Contractors, Ovenden, HALIFAX.

WANTED, experienced Service Layers for a Town in Ireland.
Applications, giving full Particulars, to be directed to No. 3365, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a young Man as Stoker, and to make himself generally useful in Small Gas-Works. Wages 24s. per week.
Apply, by letter, with *copies* of Testimonials, to the MANAGER, Gas-Works, Seaford, SUSSEX.

WANTED, immediately, an Operator for Carburetted Water-Gas Plant. None but those having sole charge of Apparatus need apply. Wages 6s. per day. Permanent Situation.
Apply, with References, to the MANAGER, Gas-Works, BEXHILL.

WANTED, immediately, a steady and reliable man as STOKER. Must be a good Shovel Charger. Wages 28s. per week. Permanent Situation.
Apply, with References, to the MANAGER, Gas-Works, BEXHILL.

WANTED, a competent Gas-Fitter, used to House and Gas-Stove Fitting. Wages 30s. per week of 57½ Hours (permanency).
Apply, by letter, enclosing Testimonials as to Character and Ability, to the MANAGER, Gas-Works, DORKING.

THE Directors of the Whitchurch and District (Hants.) Gas Company require the services of a competent GAS MANAGER for their Works at Whitchurch.
Applications, stating Age, Qualifications, and Salary expected, must be addressed to the SECRETARY of the Company, 46, CANNON STREET, E.C., on or before the 27th inst.

WORKS Manager wanted by a Firm of Gas Engineers and Contractors in South Yorkshire. Must be practical, accustomed to control Men, and have experience in all classes of work passing through the different departments, including Mechanic's, Pattern, Moulding, and Smith's Shops. Liberal Salary to competent Man.
State (by letter) Age, Experience, and Salary to No. 3363, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REPRESENTATIVE GAS-STOVE TRADE.

WANTED, by one of the largest Firms, an experienced Gentleman to represent them, on Expenses, Salary, and Commission. Connection with Gas Departments in Midlands and South Wales desirable. None but really first-class applications considered. Age about 35 preferred. Send Photo. State Experience, Salary, &c.
Reply to Box 19, Pratt's Advertising Offices, 32, NEW BRIDGE STREET, E.C.

WANTED, by a Provincial Gas and Water Company, Young Man as ASSISTANT in the DISTRIBUTING DEPARTMENT. One with a knowledge of Plumbing preferred. He must be of good address, have a thorough knowledge of Cooking and Heating Appliances, and be able to advise and deal with Consumers on all matters appertaining to Gas and Water Supply.
Salary about £120 per annum according to Qualifications.
Applications, with *copies* of not more than Three recent Testimonials, to be addressed to No. 3364, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

NEW SWINDON GAS COMPANY.

WANTED, by the above Company, a thoroughly practical Man as WORKS' FOREMAN. Age not to exceed 35. Will be required to live on the Works.
Applications, stating Qualifications and Salary required (exclusive of House, Coal, and Gas), to be sent in to the undersigned not later than Saturday, Nov. 4, 1899.

JOHN J. JERVIS,
Secretary.
New Swindon Gas Company,
Swindon, Wilts.

COUNTY BOROUGH OF BLACKBURN.

ASSISTANT GAS ENGINEER.

THE Gas Committee of the Corporation of Blackburn are prepared to receive APPLICATIONS for the position of ASSISTANT GAS ENGINEER.
Any Person applying will be required to have had a thorough training in Gas Manufacture, Purification, and Distribution, together with a Practical knowledge of Sulphate Making. He must also be able to prepare Plans and Specifications for any intended New Works.
Applicants must be over 25 Years and not over 30 Years of Age.
Salary to commence at £150 per annum, and to increase by five annual Increments to £200 per annum.
Applications, enclosing not more than Three recent Testimonials, to be sent, addressed to the Chairman, properly endorsed "Assistant," not later than Saturday, Nov. 4, 1899.
Canvassing any Member of the Council will be considered a disqualification.

By order,
S. R. OGDEN,
Gas Engineer.
Gas-Works, Blackburn,
Oct. 18, 1899.

THE Sittingbourne District Gas Company require the services of an experienced ENGINEER and MANAGER for their Gas-Works. He must be capable of Designing and Superintending the carrying out of extensions, and competent to undertake the entire control of the Works, Mains, and Services, and the supervision of the Manufacture of Gas and Sulphate of Ammonia. Salary £180, with Residence, Coal, and Gas free. The duties to commence the 1st of January next.
Applications, stating Age, Experience, present Employment, &c., accompanied by *copies* of not more than three recent Testimonials, to be sent to the undersigned, on or before the 6th day of November, 1899.

W. J. HARRIS,
Secretary.
Sittingbourne, Oct 21, 1899.

IRON ROOF for Sale, 132 feet long by 53 ft. 4 in. Span, in first-class condition.
Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

ENGINE and Exhausters, 20,000 and 30,000 cubic feet per hour, delivered immediately. Cheap to clear.
J. F. BLAKELEY, Thornhill, DEWSBURY.

CAST Tank, 31 feet diameter, 12 feet deep, £4 15s. per ton. Straps and Bolts included Five Years old.
J. F. BLAKELEY, Thornhill, DEWSBURY.

FOR SALE — Horizontal Engine and EXHAUSTER passing 15,000 cubic feet per hour, £30. VERTICAL ENGINE, £15. STATION METER, £12, passing 15,000 cubic feet per hour (Maker, Beale), and Two BOILERS. All in excellent condition.
HARGREAVES AND SMITH, Metal Brokers, WOLVERHAMPTON.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

RAMSGATE CORPORATION.
(WATER DEPARTMENT.)

FOR SALE.

COMPOUND Jet Condensing Beam ENGINE, 25 N.H.P., in excellent order. Removed for Extension.

High-Pressure Cylinder	12 inch.
Low-Pressure Cylinder	20 inch.
Stroke	3 feet.

Can be seen at any time between the hours of Ten and One.
Any further Particulars may be obtained on application to

WILLIAM A. VALON,
Engineer.

RETORTS AND FIRE-BRICKS.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company are prepared to receive TENDERS for the supply of WORTLEY or STOURBRIDGE FIRE-CLAY RETORTS, FIRE BRICKS and CLAY.
Specification and Form of Tender may be obtained from the undersigned, to whom Tenders, endorsed "Retorts, &c.," must be delivered on or before Noon of Monday, Oct. 30, 1899.

J. M. VEEVERS,
Engineer and Secretary.
Gas Offices, Rochester,
Oct. 19, 1899.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retort Bricks, &c.) required at their Neepsend, Effingham Street, and Grimesthorpe Stations during the next Twelve Months.
Specifications and Forms of Tender may be had on application to the Company's Engineer, Mr. J. W. Morrison.
The Directors do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, marked "Tender for Fire-Clay Goods," must be delivered by post to the undersigned not later than the first post on Saturday, Nov. 4.

HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
Oct. 14, 1899.

BANDON TOWN COMMISSIONERS (CO. CORK).

TENDERS FOR GAS COAL.

THE Commissioners are prepared to receive TENDERS for the supply of 1000 Tons of Best Screened GAS COAL, delivered at Alcert Quay, Cork, in such quantities as may be and when required, from date of acceptance of Tender to the first week of March, 1899.
No Tender Forms issued.
Tenders, stating Price per ton (20 cwt.) delivered as above, to be sent to the undersigned, and marked "Tender for Coal," not later than the 3rd of November, at Eleven o'clock a.m.
The Commissioners reserve the right to accept Tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
JOHN M'DONNELL,
Town Clerk.
Board-Room, Gas-Works,
Bandon, Oct. 20, 1899.

CLACTON URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

THE above Council are prepared to receive TENDERS for the provision and laying of an 11-inch CAST-IRON MAIN, about 7½ miles in length, between Great Bentley and Clacton-on-Sea and other Works, in accordance with the Drawings and Specifications prepared by Messrs. John Taylor, Sons, and Santo Crimp, Civil Engineers, 27, Great George Street, Westminster, at whose Offices the Plans may be inspected, and Copy of Specification and Form of Tender can be obtained upon depositing £5 (cheque only), which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Eleven-inch Main," and addressed to the Clerk to the Council, are to be delivered at the Council Offices, Town Hall Buildings, Clacton-on-Sea, on or before the 15th day of November next.
The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk.
Clacton-on-Sea,
Oct. 20, 1899.

CLACTON URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

TO CONTRACTORS.

THE above Council invite Tenders for the supply of about 50 Tons of CAST-IRON SOCKET and SPIGOT PIPES.
Copies of Specification and full Particulars can be obtained on application to Mr. Sydney Francis, Engineer to the Council, Town Hall Buildings, Clacton-on-Sea.
Tenders, sealed and endorsed, to be delivered to the undersigned not later than Monday, the 6th of November next, at Four o'clock p.m.
The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk.
Town Hall Buildings,
Clacton-on-Sea, Oct. 20, 1899.

ISLE OF THANET GASLIGHT AND COKE COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR produced at their Works from Oct. 1, 1899, to Sept. 30, 1900.
Further Particulars as to quantity and terms of delivery, can be had on applying to the Manager, Mr. James Dougall.
Tenders, endorsed "Tender for Tar," to be sent in on or before Nov. 2, 1899, addressed to the Chairman of the Company.
The Directors do not bind themselves to accept the lowest or any Tender.

By order,
THOS. C. FULLER, F.I.S.,
Secretary.
Gas Company's Offices:
The Dane, Margate, Oct. 21, 1899.

ISLE OF THANET GASLIGHT AND COKE COMPANY.

TENDERS FOR £8000 3½ PER CENT. ORDINARY STOCK.

THE Directors are prepared to receive TENDERS for £8000 ORDINARY STOCK; such Stock to be paid up in full on or before the 9th of February, 1900, and to bear Dividend from that date.
A Deposit of 10 per cent. of the nominal amount of Stock tendered for must accompany each Tender, and half the amount of Premium offered; the balance to be paid within Three Months after date of acceptance.
Any amount, being not less than £10, or a multiple thereof, may be tendered for; and the Stock will be registered in the Company's Books, in the names of the purchasers or their nominees, free of expense. No Stockholder can hold less than £20.
Where no allotment is made, the Deposit will be returned, and in case of partial allotment, the balance of the Deposit will be applied towards payment of the amount due on allotment.
The Stock will be allotted to the highest bidders.
The Dividends payable on the Stock now offered for sale by Tender are regulated by the Sliding-Scale, as set forth by Section 11 of the Thanet Gas Act, 1898.
The Initial Price of Gas is 4s. 2d.; Present Price of Gas is 2s. 6d. per 1000 Cubic Feet.
Tenders must be sent to the Chairman on or before the 9th of November, 1899, after which date no Tender can be received.
Forms of Tender can be obtained on applying at the Offices, The Dane, Margate.

By order,
THOMAS C. FULLER,
Secretary.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 7th day of November, 1899, at Three o'clock in the Afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th day of June last, to declare a Dividend on the Preference Share Capital, and to transact the General Business of the Company.
The TRANSFER BOOKS WILL BE CLOSED from the 24th of October to the 7th of November, both inclusive.

By order of the Board,
SAMUEL WOOD,
Secretary.
Offices: 30, Gracechurch Street,
London, Oct. 20, 1899.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF FIVE PER CENT. PREFERENCE STOCK.

NOTICE is Hereby Given, that the Directors have instructed Mr. ROBERT MACK, Auctioneer, to SELL BY AUCTION, at the Offices of the Company, Grainger Street West, Newcastle-upon-Tyne, on Wednesday, the 1st day of November, 1899, at Twelve o'clock noon precisely,

£28,500 OF THE NEWCASTLE-UPON-TYNE AND GATESHEAD GAS PREFERENCE STOCK,

Bearing a fixed Preferential Dividend of Five per Cent. per annum, being part of the moneys authorized to be raised by the Newcastle-upon-Tyne and Gateshead Gas Act, 1896, the Redheugh Bridge Act, 1896, and the various Acts therewith respectively incorporated.

For Conditions of Sale and Further Particulars, apply to the undersigned.

(Signed) THOS. WADDOM,
Secretary.

Gas Office, Newcastle-upon-Tyne,
Oct. 10, 1899

IN CHANCERY.—In the Matter of the Companies Acts 1862 and 1890, and in the Matter of the THORNTON SCARTH AUTOMATIC LIGHTING SYNDICATE LIMITED, of Artillery Street, Small Heath, Birmingham, Manufacturers of the "Thorscar" Automatic Acetylene Gas Apparatus.

THE Receiver and Manager of this Company, appointed under an Order dated the 28th day of July, 1899, is authorized under an Order of the Court dated the 27th day of September, 1899, to offer the above BUSINESS for SALE, as a going concern.

The Company is entitled to take on under lease the substantial Manufactory situate in Artillery Street, Small Heath, Birmingham, on the Canal side, in their occupation for the residue of the term of 28 years from the 8th day of February, 1898, at the apportioned Annual Rent of £130.

There are also two further tenancies of Premises adjoining at rents amounting to £40 per annum.

Included in the Plant, Tools, Machinery, &c., are a—
6 horse power Taunton Motor,
12-inch Centre Screw-Cutting Lathe,
Four other Lathes, various sizes,
4-feet Radial Arm,
Two Drilling-Machines,
and the same may be inspected on application to the Receiver.

The Stock-in-Trade, a schedule of which has been prepared, is open for inspection; and the Sale will include the Receiver's rights and interest in the Patents for the manufacture of Acetylene Generators, in the following countries: Great Britain, Russia, Germany, France, Natal, Cape Colony, Victoria, New South Wales, Queensland, New Zealand, Spain, Belgium, Switzerland, South African Republic, Italy, Hungary, Orange Free State, Norway, Austria, India, Tasmania, South Australia, Western Australia, United States of America, Canada.

The Purchaser may treat for the purchase of the Book Debts.

For further Particulars, apply to Messrs. PINSENT AND Co., Solicitors, 6, BENNETT'S HILL; or Messrs. SHARP, PARSONS, AND Co., Chartered Accountants, 120, COLMORE ROW, BIRMINGHAM.

SANDELL'S

Gas Companies' Account Books.

The Gas Companies' Expenditure Journal.

With Printed Headings and Analyzing Guide, for keeping the Expenditure of Gas Companies upon the easiest and most correct method, and in accordance with the provisions of the Gas-Works Clauses Act of 1871. Size: 16½ in. by 17½ in.

Price: Half-bound, Cloth Sides, Two Quires, 36s.; Three Quires, 45s.

This Book and its predecessor (on the same principle, have been in use since 1867.

The Gas Companies' Rental-Book.

A companion Book to above, with Printed Headings and Illustration, for keeping the Consumers' Accounts with Gas Companies on labour-saving principles. Compact and Precise. A boon to Secretaries, Accountants, and Auditors.

Size and Price as above.

Consumers' Names are only written once in every two years by this system.

The Analyzed Wages Book.

Compiled for use in conjunction with the above Expenditure Journal, with Printed Headings, and adapted to the form for making up the Annual Accounts under the provisions of the Gas-Works Clauses Act, 1871. Size: 15 in. by 10½ in.

Price: Half-bound, Cloth Sides, Two Quires, 15s.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS's OFFICES, No. 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, Oct. 25, at Two o'clock, in Lots.

Particulars at the AUCTIONEER'S OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS GAS COMPANY, LIMITED.

400 £10 SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, on Wednesday, Oct. 25, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS.

SOUTH-WEST SUBURBAN WATER COMPANY.
SIXTY £10 ORDINARY SHARES and 108 £10 FIVE PER CENT. PREFERENCE SHARES.

PORTSEA ISLAND GAS COMPANY.
SIX £50 FULLY-PAID "B" SHARES.

WEST HAM GAS COMPANY.
FIFTY £5 ORIGINAL SHARES.

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS, at the Mart, E.C., on Wednesday, Oct. 25, at Two o'clock.

Particulars of the AUCTIONEER as above.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £7500 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 7, at Two o'clock, in Lots,

£7500 OF NEW ORDINARY 7 PER CENT. STOCK in the above Undertaking.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the
HERNE BAY GAS AND COKE COMPANY, LIMITED.

NEW ISSUE OF 1000 £5 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 7, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Trustees of Mrs. Louisa Baynes deceased, and other Owners.

NEWHAVEN GAS COMPANY, LIMITED.
SIXTY SHARES.

LEA BRIDGE DISTRICT GAS COMPANY.
100 £10 ORDINARY SHARES.

NORTH MIDDLESEX GAS COMPANY.
50 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 7, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £5000 "D" GAS STOCK.

Ranking for a Maximum Dividend of 7 per cent; the last Dividend on similar Stock in the Company having been 6 Guineas per Cent. per annum.

TO BE SOLD BY AUCTION BY

MR. ALFRED RICHARDS, at the Mart, E.C., on Wednesday, Nov. 29, at Two o'clock.

Particulars of the AUCTIONEER, as above.

Do not throw away any more of your

ASHES

OF

INCANDESCENT MANTLES

Buyers are

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Manufacturers of Incandescent Burners.

WELLINGBOROUGH.

TO CAPITALISTS, INVESTORS, AND OTHERS.

600 £10 ORDINARY "C" SHARES
IN THE
WELLINGBOROUGH GASLIGHT COMPANY, LIMITED,

TO BE SOLD by Auction, by Messrs, PENDERED AND SON, at the Hind Hotel, Wellingborough, on Wednesday, the 25th day of October, 1899, at Five for Six o'clock in the Evening, in convenient Lots to suit Purchasers, pursuant to the "Wellingborough Gas Order, 1899."

N.B.—The Dividend paid for the last two Half Years on the £10 Shares of the Company has been at the rate of 9 per cent. per annum, free from Income-Tax. As the business of the Company is steadily increasing, and there is an ample Reserve Fund, it may be confidently anticipated that this Dividend will be maintained in the future.

There are no Preference Shares in the Company, and all the Shares rank for Dividend according to their relative nominal value.

Printed Particulars and Conditions of Sale may be obtained of the AUCTIONEERS, WELLINGBOROUGH; of Mr. S. H. KIMBELL, the Gas Company's Offices, COMMERCIAL PLACE; or of Messrs. SHARMAN, JACKSON, AND ARCHER, Solicitors, WELLINGBOROUGH.

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— NINETEENTH YEAR —

AN

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OF THE

METROPOLITAN WATER COMPANIES

(Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex)

AND OF THE

CORPORATION WATER UNDERTAKINGS

OF

EDINBURGH, GLASGOW, & MANCHESTER,

FOR THE YEAR 1898-1899.

Compiled and arranged by

LASS, WOOD, & DREW,

Chartered Accountants.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND Co., HAMBURG.

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Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.

CHESTERFIELD.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

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HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.
Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.
Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.
Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.
These Coals may be bought through the Principal Merchants in England, or direct from
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HOLMSIDE & SOUTH MOOR OFFICES,
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WORKED BY THE
WEARDALE IRON & COAL CO., LD.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL CO., LD.
QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS-FITTINGS.
BURNERS
Welsbach Pattern
per **7/6** Doz.
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INCANDESCENT

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FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
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Yield of Gas per Ton	10,500 Cubic Feet.
Illuminating Power	16·4 Candles.
Coke	68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
The Wallsend & Hebburn Coal Company, Ltd.
B Lombard Street,
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W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

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NEWBATTLE COLLIERIES,
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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
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Yield of Gas 11,000 cubic feet per Ton of Coal, as per Analysis by

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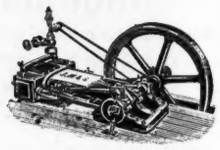

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Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

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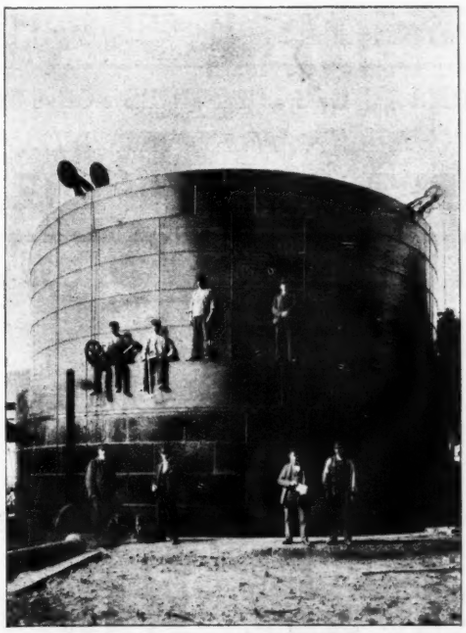

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Specially adapted for Lighting Railway Stations, Docks, Sheds, Workshops, Streets and Squares, Shop Windows, &c., &c.

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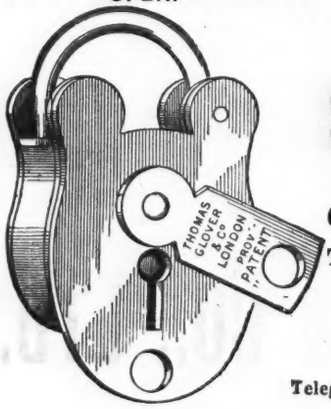

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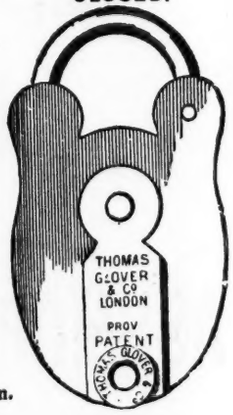

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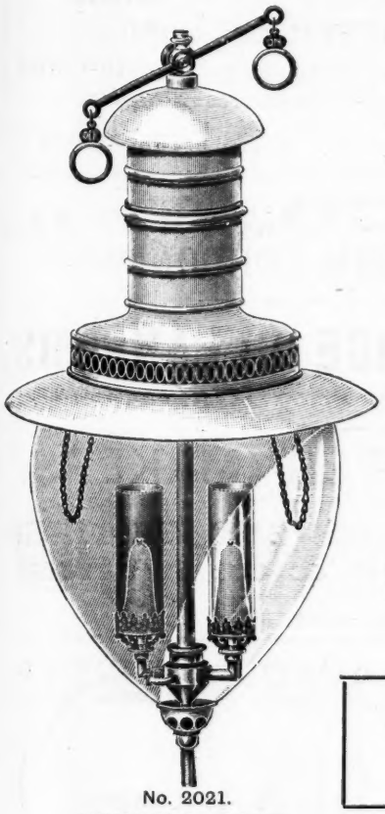
For Inside and Outside Lighting.



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WINDOW LIGHT.

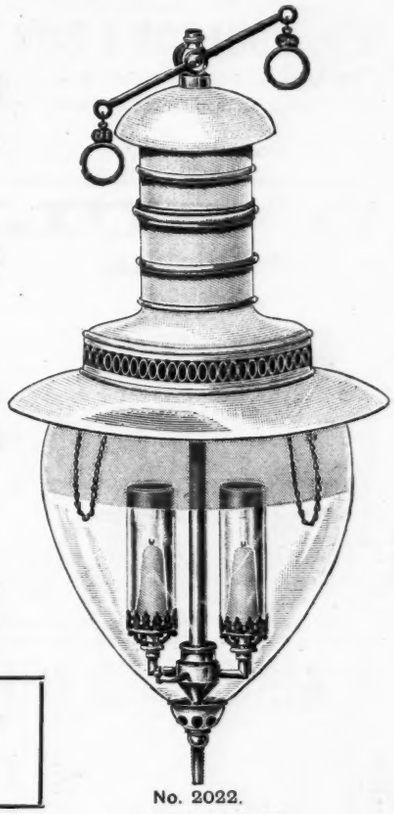
NEATLY ENAMELLED
IN FAWN COLOUR WITH
WHITE AND GOLD RELIEF.

No. 2020 is for Inside Lighting, with clear flint Globe.

No. 2021 is for Window Lighting, and has a diagonally obscured Globe.

No. 2022 is for Lobby Lighting, and has an opal top Globe.

A similar Lamp made for Electric Light.



No. 2022.
LOBBY LIGHT.

Prices:—

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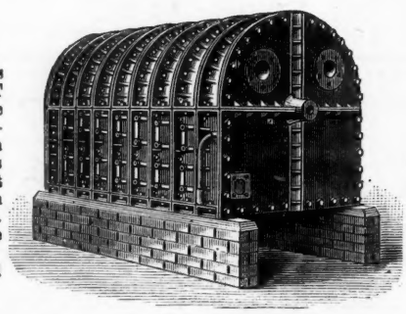

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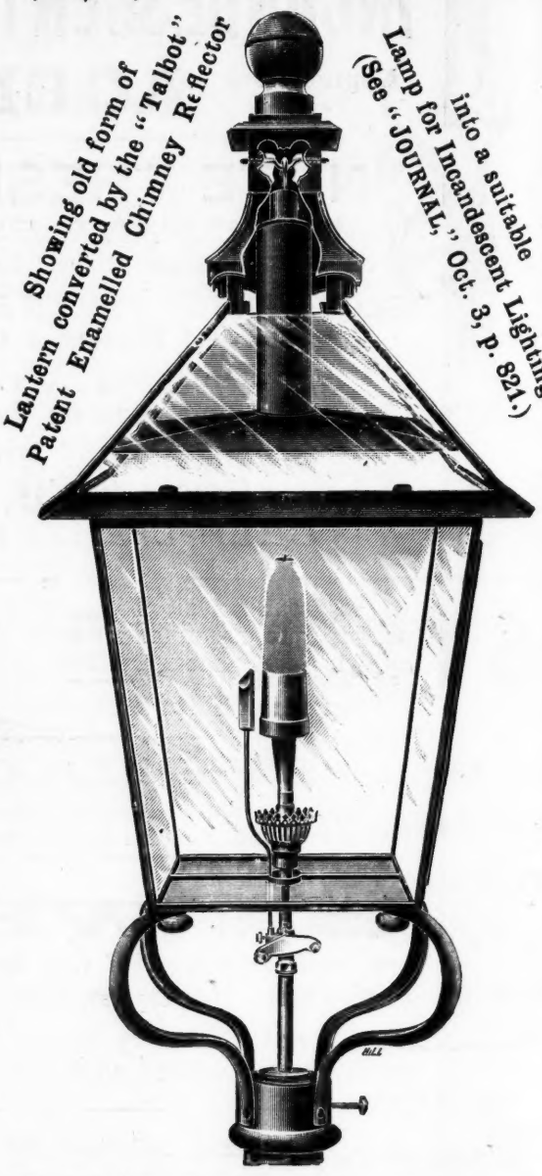
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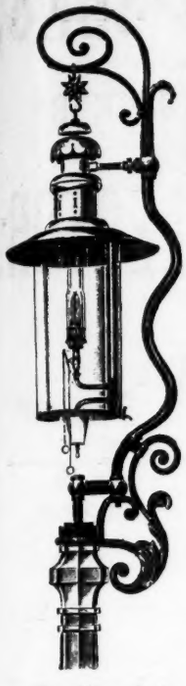

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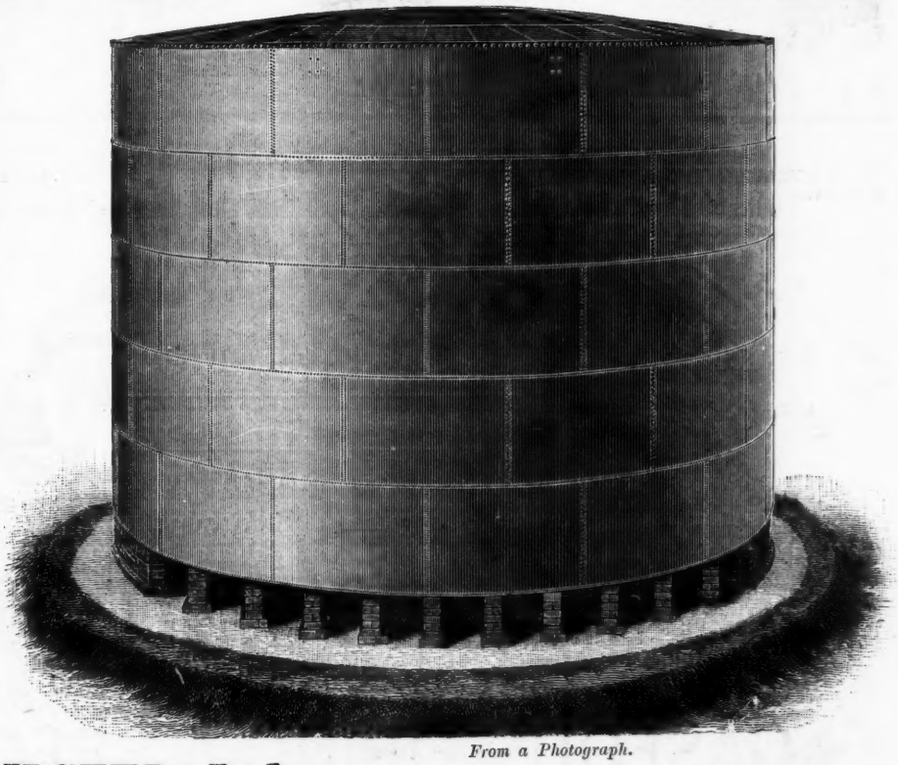

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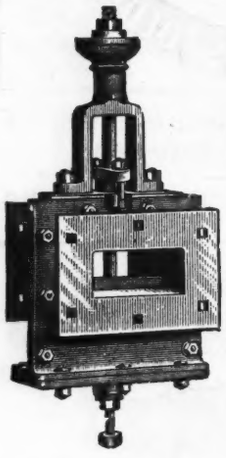

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